(Historical-for J.B.)

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VariTyper
Composing Machine
SERVICE MANUAL

VariTyper® Corporation
A SUBSIDIARY OF ADDRESSOGRAPH-MULTIGRAPH CORPORATION
720 Frelinghuysen Avenue, Newark, New Jersey 07114

SERVICE MANUAL

for

VariTyper Composing Machines

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MECHANICAL and ELECTRICAL PRINCIPLES

Unit Spacing Machines

The mechanical operation of the VariTyper machine is divided into two phases, the print phase and the carriage movement phase. The print phase includes all of the parts and assemblies whose functions are directly involved in the process which starts with the operation of a keylever and ends with the release of the hammer and the resulting printed character. The carriage movement phase begins immediately after the character is printed and includes all of the parts and assemblies involved in the process of returning the hammer to its rest position and the movement of the carriage.

For the purpose of mechanical discussion, the two phases are distinct actions and their separation clearly marked. Operationally, however, the two phases are so closely joined that the distinction is not so clearly discernable. The blending of the two phases results in what seems to be one smooth operation and rightly so, since many of the timing procedures and adjustments are performed with this aim in mind.

In this section of the manual, Mechanical and Electrical Principles, all of the parts and assemblies involved in the complete operational cycle of the VariTyper machine are described and their functions, in relation to other parts and assemblies, pointed out.

OPERATIONAL CYCLE

PRINT PHASE

The print phase includes all of the parts and assemblies whose functions are directly involved in the process which starts with the operation of a keylever and ends with the release of the hammer and the resulting printed character.

The term touch, as it pertains to VariTyper machine operation, is the amount of pressure required to bottom a keylever in order to print a character. Beside the physical aspect, the term also designates the process or mechanical sequence from keylever operation to printed character.

The VariTyper machine keyboard is a standard, three-row keyboard consisting of thirty character keys arranged in three rows of ten each. Functions such as shifting for capital letters, back spacing, and tabulating are performed through the operation of function keys. The space bar at the bottom of the keyboard provides one unit of space for uniform spacing between words.

All of the character keylevers are supported in two series of slots (outer and inner comb) cut into the frame of the machine (Figure 2-3,4). The levers rest on, and when operated pivot on, the keylever fulcrum which is located between the two combs and is attached to the machine frame (Figure 1-4). The keylevers are retained in the outer comb by the keylever retainer (Figure 1-6).

Function keylevers are supported in the outer comb and are attached to the function mechanism they control.

The space bar lever, like the character keylevers, is supported in both combs. It does not, however, rest or pivot on the keylever fulcrum. It rests and pivots on its own fulcrum which is part of the space bar bracket (Figure 2-2). This bracket is mounted underneath the outer comb.

Located directly above the inner comb are the two driver levers (Figure 1-2) to which are attached the driver arms (Figure 3-4). The driver levers are supported on shafts which are mounted through the

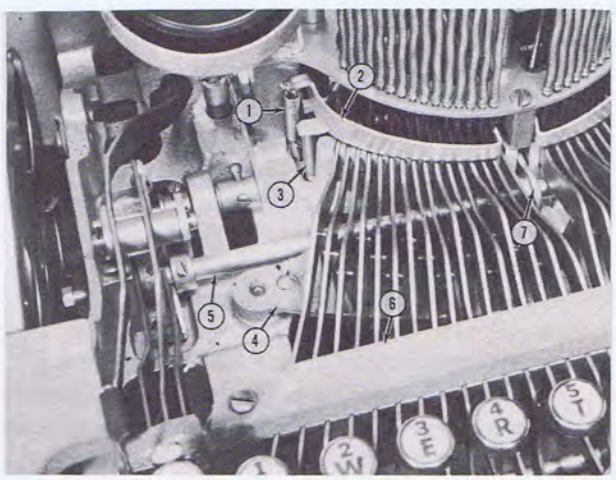


FIGURE 1

1—Driver Lever Return Spring 2—Driver Lever 3—Driver Lever Adjusting Screw 4—Fulcrum 5—Anvil Lift Lever Shaft 6—Keylever Retainer 7—Anvil Lift Lever

base of the index head casting. The left driver lever is actuated by the keylevers on the left side of the keyboard (keylevers 1-15), and the right driver lever is actuated by the keylevers on the right side of the keyboard (keylevers 16-30). (*Note:* Keylevers are numbered from left to right in the order of their position in the outer comb.)

Each driver lever is held in and returned to its unoperated position by a tension spring. The function of the driver levers and arms is to actuate the shuttle arm.

The shuttle arm (Figure 4-1) holds the type font in the anvil and, when actuated by the driver arm, moves the type font from its rest position to the print position. Positioning of the desired character on the type font in front of the hammer is determined by the index head pin of the keylever which was operated.

The index head pins and return springs are supported between the top and bottom plates of the index head (Figure 3). Operation of a keylever raises that particular lever's index pin and places it in the path of the shuttle arm tail which is being rotated by the driver arm. The shuttle arm's rotation is terminated at the point where the shuttle arm tail contacts the index head pin resulting in proper positioning of the type font for the character selected.

At this point, the first part of the touch action, type positioning, has been completed. To initiate the second part of the action and actuate the escapement mechanism, it is necessary to depress the keylever slightly beyond the point where the first part of the touch action ended. This is made possible by the spring loaded cam (Figure 4-2) on the underside of the shuttle arm. As depression of the keylever is continued, the driver arm forces the cam forward permitting the additional keylever movement despite the fact that the shuttle arm itself cannot move beyond the index head pin.

One of the functions of the escapement mechanism is to control the movement of the hammer. The parts of the escapement which are involved in the second part of the touch action are the escapement wheel, escapement pawl, hammer levers front and rear, and hammer eccentric screw (Figure 5-3). Also involved are the trip frame and the escapement lever (Figure 5-6) which constitute the operating medium between the keylevers and the escapement mechanism.

The trip frame (Figure 5-8) is located below the index head and is mounted on two pivot screws in the machine frame. The front of the trip frame is positioned slightly above the tips of the keylevers.

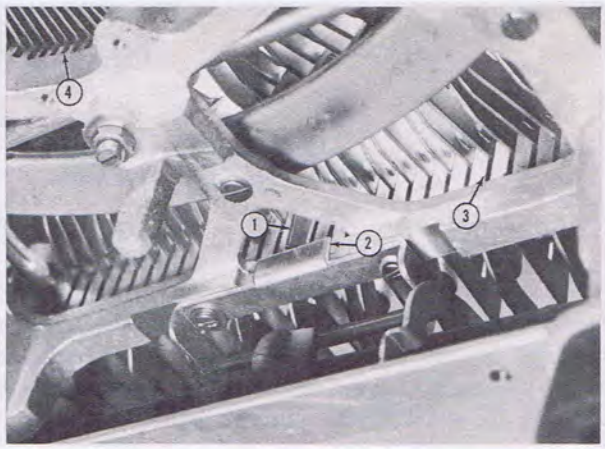


FIGURE 2

1–Space Bar Lever 2–Space Bar Lever Fulcrum 3–Outer Comb 4–Inner Comb

The escapement lever is mounted on the back of the machine frame by a screw and bushing which permits the lever to rotate.

When a keylever is operated, it raises the front part of the trip frame. This action causes the opposite end of the trip frame to contact the tail of the escapement lever, thereby raising the blade of the lever into the escapement wheel. At the same time that the escapement lever is entering the escapement wheel, a forked arm on the top of the lever actuates the escapement pawl and disengages it from the escapement wheel.

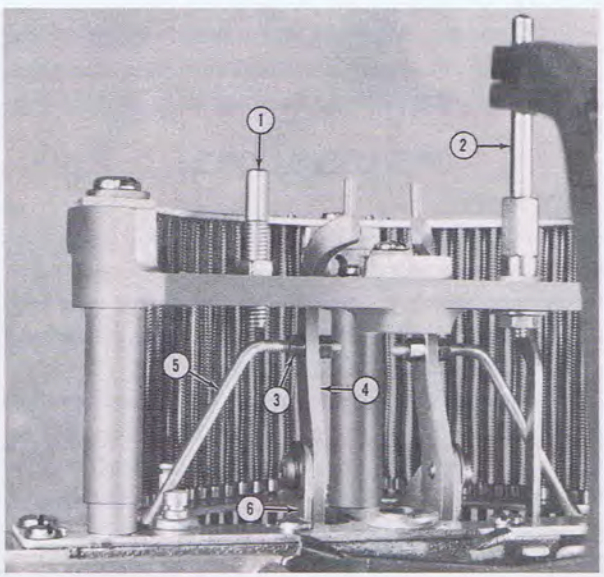


FIGURE 3

1–Anvil Height Adjusting Screw 2–Anvil Locating Pin 3–Driver Arm Adjusting Nut 4–Driver Arm 5–Driver Arm Brace 6–Driver Lever

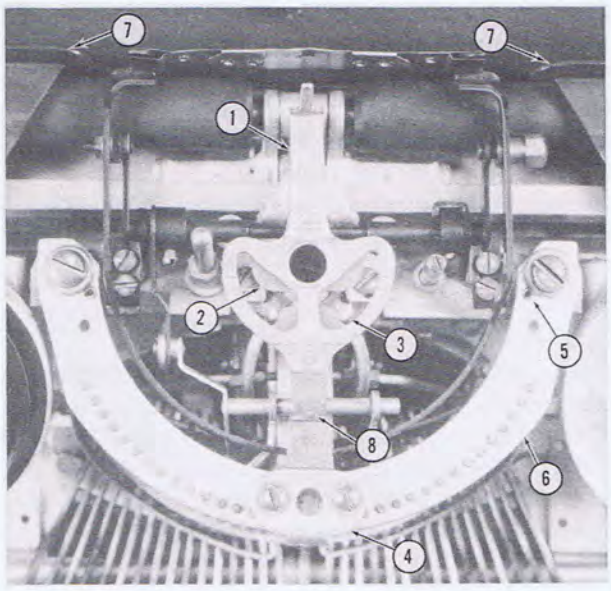


FIGURE 4

1—Shuttle Arm 2—Shuttle Arm Cam 3—Driver Arm 4—Idle Pin Bracket 5—Pin 6—Index Head Top Plate 7—Line Guides 8—Idle Pin

The escapement pawl (Figure 6) is supported on a shaft which is mounted between the hammer levers front and rear. The function of the pawl is to hold back the escapement wheel which is under constant tension being exerted by the motor box. When the escapement pawl is disengaged from the wheel, the wheel is free to be rotated by the motor box tension which is transmitted to the escapement wheel through the motor box gear. However, rotation of the escapement wheel is prevented by the escapement lever which has temporarily assumed the pawl's function.

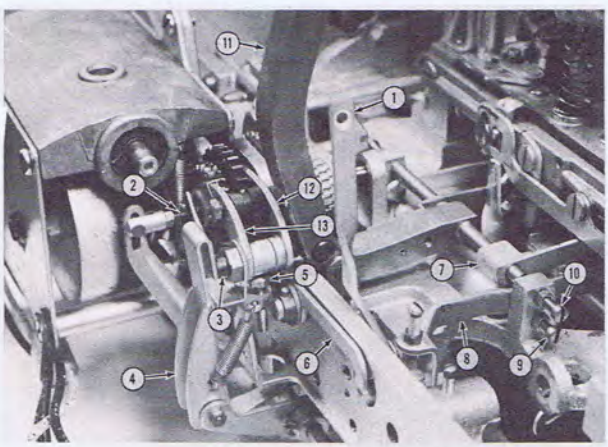


FIGURE 5

1—Tabulator Reed 2—Push Rod 3—Hammer Eccentric Screw 4—Repeat Link Lever 5—Drop Adjustment Screw 6—Escapement Lever 7—Shield Actuating Lever 8—Trip Frame 9—Trip Frame Pivot Screw 10—Hammer Pivot Screw 11—Hammer 12—Hammer Lever, Front 13—Hammer Lever, Rear

The hammer, whose function is to strike the type font and print the character, is supported on a shaft which is mounted on two pivot screws located in the machine frame just above the trip frame pivot screws (Figure 5-10). The hammer is linked to the escapement mechanism by means of a swivel in the base of the hammer just above the hammer shaft, and an eccentric screw located in a threaded hub between the hammer levers front and rear (Figure 5-12,13). The two levers are joined at the hub and secured with a nut which also locks the eccentric screw in place. The levers rotate as a unit on the escapement wheel shaft.

As the escapement pawl is disengaged from the escapement wheel, the hammer is free to be pulled forward by the hammer actuating spring (Figure 22-1). As the hammer moves forward to strike the type font, it raises the hammer levers and positions the escapement pawl under the next tooth of the escapement wheel. At this point, the second part of the touch action, the printing of the character, has been completed. And, with the completion of the touch action, the print phase is concluded.

CARRIAGE MOVEMENT PHASE

The carriage movement phase is that part of the operational cycle which starts immediately after the character is printed and includes the return of the hammer to rest position and the movement of the carriage in order to position the paper to receive the next character to be printed. This phase also includes the operation of parts and assemblies which are related to carriage movement, such as the tabulator and carriage release mechanisms.

Carriage movement is controlled by the escapement mechanism. The escapement parts involved are the escapement gear sleeve (Figure 7-1) and the escapement shaft pawl and pawl spring (Figure 7-5, 6).

The escapement gear sleeve is a sleeve on which are press fitted the four horizontal spacing gears. Also attached to the external part of the gear sleeve is the back space ratchet wheel. The gear sleeve fits and rotates on the escapement wheel shaft.

A portion of the internal part of the sleeve is machined to form a ratchet. These teeth mesh with the teeth of the escapement shaft pawl which is supported in the body of the escapement shaft. The pawl spring is housed in the escapement shaft and exerts tension on the pawl and keeps it in constant contact with the gear sleeve (Figure 8-3).

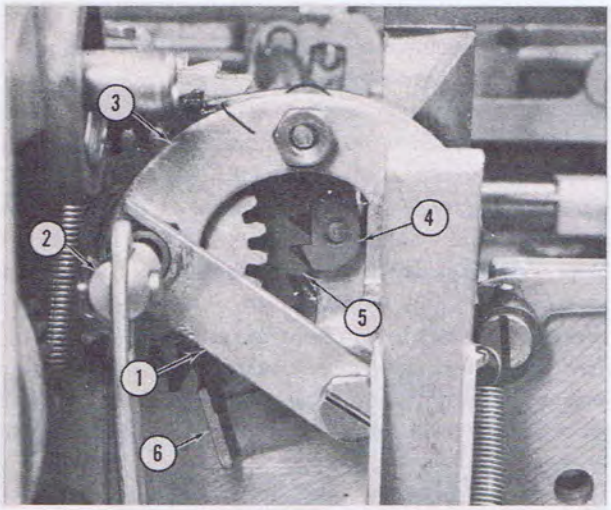


FIGURE 6

1—Escapement Wheel Retainer 2—Push Rod Head 3—Hammer Lever, Rear 4—Escapement Wheel Pawl 5—Escapement Wheel 6—Escapement Lever

At the start of this phase, the keylever is released. When this occurs, all the parts and assemblies which were actuated in the print phase such as the shuttle arm, index head pin, trip frame and escapement lever are returned to unoperated position. When the escapement lever disengages itself from the escapement wheel, the wheel is rotated by the motor box gear. As rotation occurs, the escapement wheel, through the escapement pawl, moves the hammer levers down and, in turn, pulls the hammer back to its rest position. Rotation of the wheel is terminated when the front hammer lever hub comes to rest on the drop adjustment screw (Figure 5-5).

As the escapement wheel rotates, and at the same time that the hammer is being returned to rest position, the gear sleeve rotates with the escapement wheel by means of the escapement shaft pawl. The carriage escapement rack (Figure 27-7), which is attached to the carriage assembly, rests on and meshes with one of the horizontal spacing gears. The carriage assembly, through the carriage draw band, is supplied with spring tension which pulls it to the left. Therefore, as the gear sleeve rotates, it actuates the carriage assembly (assisted by the carriage spring tension) one space. This ends the carriage movement phase and completes the operational cycle.

Parallel Shield

The purpose of the parallel shield mechanism (Figure 9) is to support the ribbon shield and ribbon, and to position the ribbon shield in front of the type font when the hammer strikes and remove it from the printing area after the character has been printed in order to make the typing visible to the operator.

Since the VariTyper machine's printing principle involves the hammer pressing the paper and ribbon against the type font, the bulk of paper and ribbon between the hammer face and the surface of the type font will cause parts of the characters adjoining the one to be printed to also print. The ribbon shield opening is wide enough to allow only the area of paper and ribbon needed to print the desired character, thereby preventing the rest of the paper and ribbon from contacting the type font. It is, therefore, the ribbon shield's function to permit a character to print with no extraneous marks or smudges.

The parallel shield frame is actuated by the hammer. Attached to the hammer shaft is the shield actuating lever (Figure 5-7) which, as the hammer moves forward, pulls down the connecting link which in turn operates the shield lift lever (Figure 9-6) and the journal shaft actuating arm (Figure 9-5). In this manner, the shield frame is raised and draws the shield toward the type font. When the hammer is re-

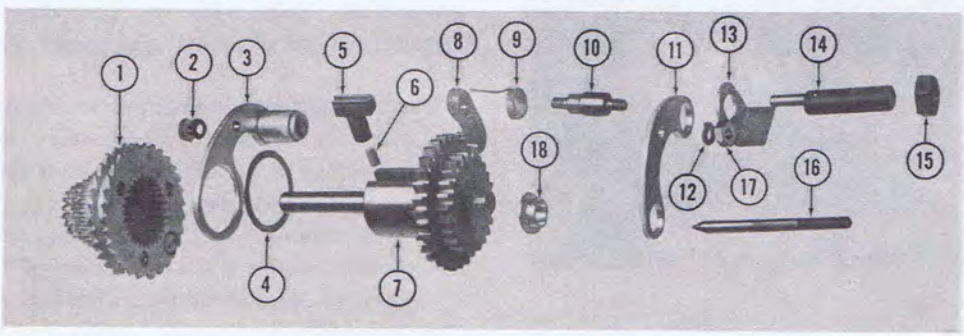


FIGURE 7

1—Gear Sleeve 2—Nut and Lock Washer 3—Hammer Lever Front 4—Spacer 5—Escapement Shaft Pawl 6—Spring 7—Hammer Escapement Wheel 8—Hammer Escapement Pawl 9—Pawl Spring 10—Pawl Shaft 11—Hammer Lever, Rear 12—Lock Washer 13—Repeat Latch 14—Hammer Eccentric Screw 15—Nut 16—Push Rod 17—Nut 18—Bushing

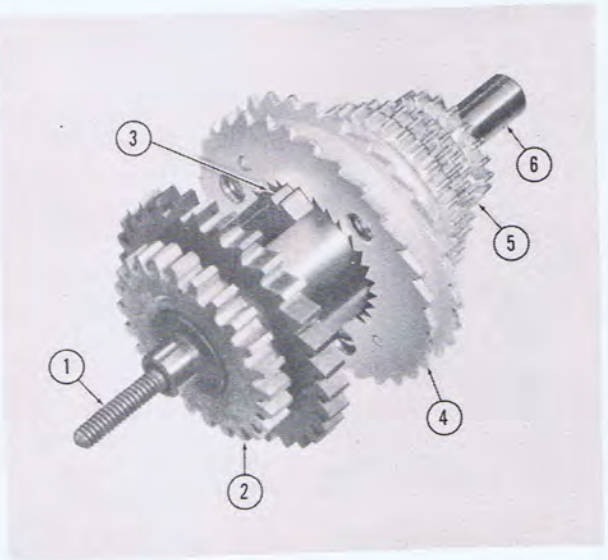


FIGURE 8

1–Push Rod 2–Escapement Wheel 3–Escapement Shaft Pawl 4–Back Space Ratchet 5–Gear Sleeve 6–Escapement Wheel Shaft

turned to unoperated position, the parallel shield is also returned to unoperated position.

Motor Box and Motor

As mentioned in the print phase description, the motor box assembly supplies the activating force, in the form of spring tension, to rotate the escapement wheel. This tension is generated by a flat spring which is tightly wound and contained in the spring barrel (Figure 10-5). One end of the spring is anchored to the spring barrel and the other end to the motor box main shaft.

The motor box cam and trip assembly (Figure 10-8) is supported on the motor box main shaft and consists of two cams – the cam and the cam trip. This assembly operates the cam lever (Figure 10-9) whose function is to operate the motor switch.

As the machine is operated, the motor box spring rotates the main shaft to which the motor box gear (Figure 10-10) is keyed. The motor box gear, in turn, rotates the escapement wheel. With each stroke of a keylever, the spring tension is reduced. It is necessary, therefore, to replenish the spring tension.

As the motor box gear rotates, a trip spring (Figure 10-11) riveted to the gear comes in contact with a stud on the cam and rotates the cam allowing the cam lever, actuated by a tension spring, to fall into the low part of the cam. When this occurs, the cam lever operates the motor switch which closes the motor circuit and operates the motor. The motor shaft is coupled to the shaft of the motor box worm which meshes with the fiber worm wheel (Figure 10-15) attached to the spring barrel. As the worm wheel and spring barrel rotate, the motor box spring is rewound. At the same time, the trip spring on the worm wheel comes in contact with the stud on the cam trip. As the cam trip rotates, it raises the cam lever from the low to the high part of the cam. This causes the cam lever to release the motor switch, thereby breaking the motor circuit. The cycle is repeated every nineteen keylever strokes resulting in the maintenance of a uniform and continuous motor box spring tension.

Space Bar

The space bar lever actuates the escapement by raising the trip frame and actuating the escapement lever in the same way that a character keylever does. Also actuated by the space bar lever is the space hook (Figure 11) which is mounted on the inner ends of the driver lever shafts. The function of the space hook is to prevent the hammer from moving forward when the escapement is actuated.

Impression Control

The VariTyper machine's uniform character impression is a result of the constant tension of the hammer actuating spring. This tension can be varied by means of the impression control lever to suit the different sizes and styles of type which can be used in the machine.

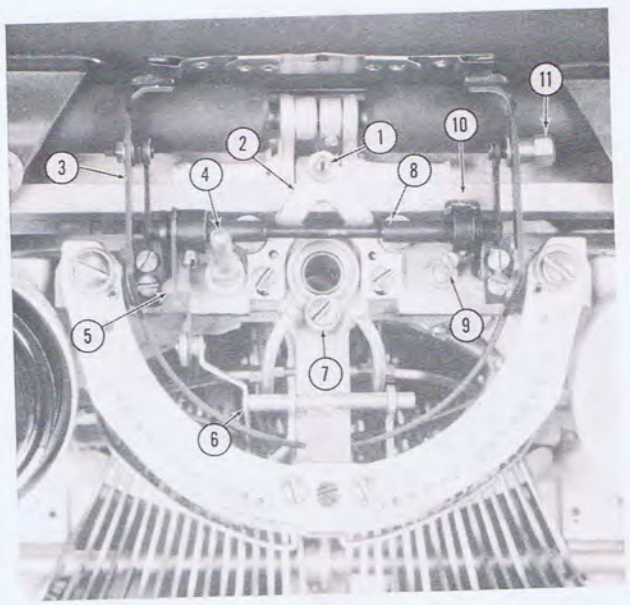


FIGURE 9

1–Carriage Front Guide Eccentric Roller Adjusting Screw 2–Carriage Front Guide 3–Shield Frame 4–Anvil Locating Pin 5–Journal Shaft Actuating Lever 6–Shield Lift Lever 7–Shuttle Arm Retaining Washer 8–Journal Shaft 9–Anvil Height Adjusting Screw 10–Collar Bracket 11–Regulator Knob

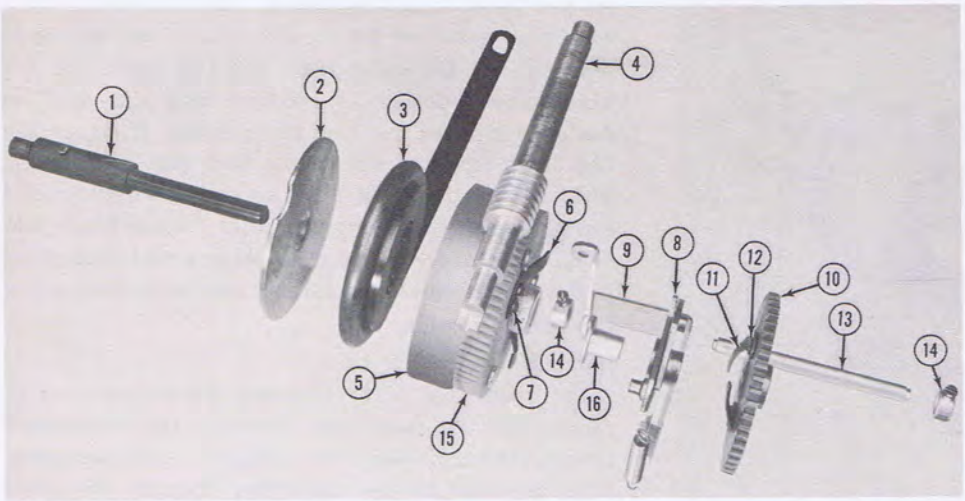


FIGURE 10
1—Spring Barrel Shaft
2—Cover
3—Spring Band
4—Worm
5—Spring Barrel
6—Trip Spring
7—Rivet
8—Motor Box Cam and Trip Assembly
9—Cam Lever (Motor Box Switch Actuator)
10—Motor Box Gear
11—Motor Box Gear Spring
12—Rivet
13—Cam Lever Shaft
14—Shaft Retaining Collar
15—Fiber Worm Wheel
16—Motor Box Cam Hub

When the lever is moved to a higher setting, the hammer actuating spring is stretched resulting in increased spring tension, thereby increasing the force with which the hammer will strike the font.

The hammer spring adjusting bar (Figure 12-1) to which the actuating spring is attached is also linked to the comma, period and hyphen suppressor assembly. When the impression lever is moved to a higher setting, the suppressor spring tension is automatically increased to compensate for the added hammer actuating spring tension. This assures adequate hammer blow for the proper printing of these three punctuation marks.

Comma, Period and Hyphen Suppressor

Due to the small size of the comma, period and hyphen, the striking force of the hammer when these characters are printed is suppressed in order to prevent premature flattening of these characters on the type font and to prevent them from cutting through the paper. This function is performed by the suppressor assembly (Figure 13) which is located on the underside of the machine frame below the index head. Brass links connect these three keylevers to the suppressor plate arm, and when one of these levers is operated, the suppressor plate arm is positioned in front of the suppressor spring lever preventing the full throw of the lever. This action causes the tension spring which is hooked between the lever and the hammer tail to exert tension in the opposite direction of the hammer actuating spring, thereby reducing the force of the hammer blow.

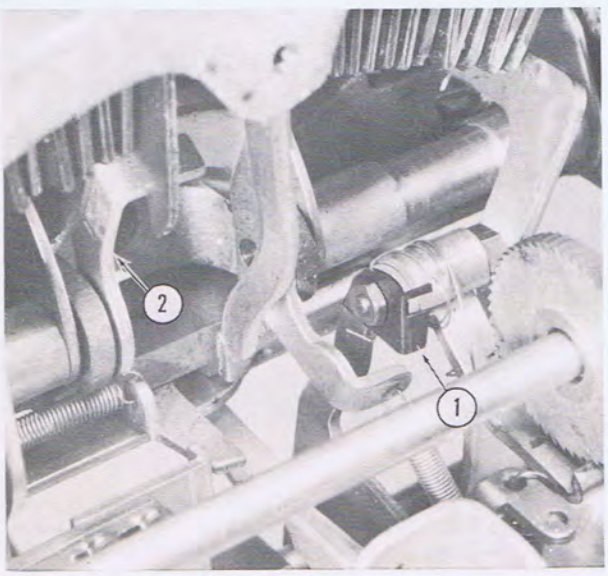


FIGURE 11
1—Hammer Cover Plate 2—Space Hook

Repeat Key

The repeat key is a function key which is used to help print large, bold-face characters which require more hammer force to print than is available through the highest impression setting.

To operate the repeat key mechanism (Figure 5), the character key lever is operated and held in its

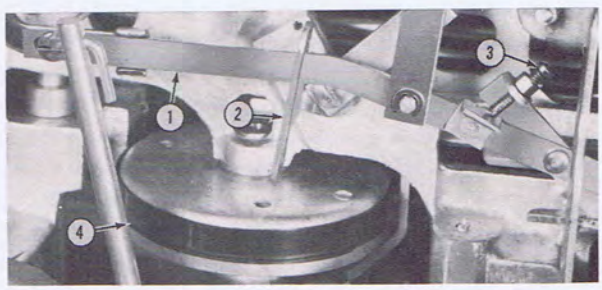


FIGURE 12
1—Hammer Spring Adjusting Bar 2—Hammer Spring Adjusting Bar Guide 3—Hammer Weight Adjusting Screw 4—Carriage Spring Barrel

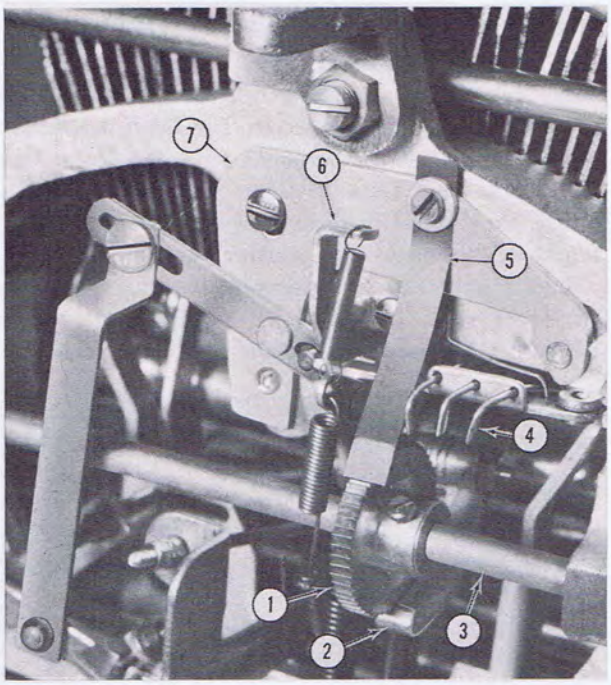


FIGURE 13

1–Ribbon Feed Ratchet 2–Ribbon Feed Pawl 3–Horizontal Ribbon Feed Shaft 4–Brass Link 5–Ratchet Stop 6–Suppressor Stop 7–Suppressor

depressed position. The repeat key is then operated once or as many times as necessary to obtain complete character coverage.

The repeat keylever rotates on a short shaft located beside the paper ribbon housing. As the key is depressed, it lifts the repeat lever link which rotates the repeat lever shaft. The repeat lever connecting arm, on which the repeat lever trip is mounted, is pinned to and rotates with the shaft. This causes the repeat key trip to engage the repeat key latch which is attached to the rear hammer lever by the hammer eccentric screw nut and draws the hammer away from the type font. The tail of the trip engages the shaft causing the trip to disengage itself from the latch, thereby releasing the hammer and allowing it to strike the type font again. Carriage movement cannot occur during this function because the character keylever is being held in its depressed position preventing the escapement wheel from rotating. When the repeat operation is completed, the character keylever is released and the carriage moves one space.

Index Head and Anvil

The index head is located in the center of the machine and is attached to the machine frame. Its purpose is to control the horizontal spacing of the

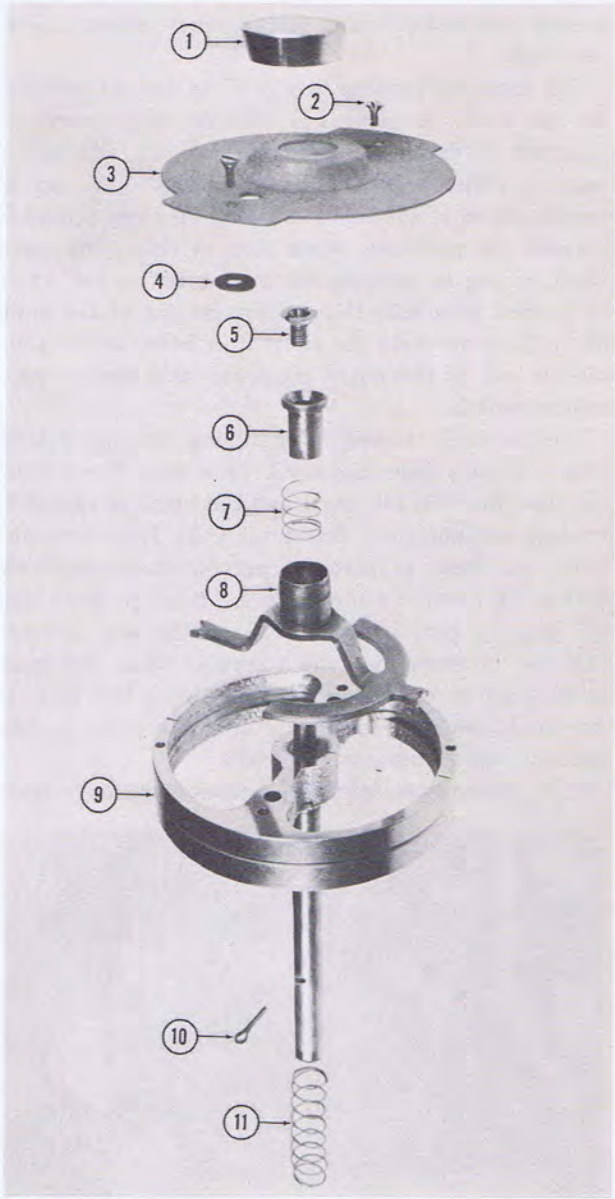


FIGURE 14

1–Anvil Knob 2–Cover Mounting Screw 3–Anvil Cover 4–Washer 5–Anvil Shaft Screw 6–Yoke Sleeve 7–Yoke Return Spring 8–Yoke 9–Anvil and Shaft 10–Cotter Pin 11–Anvil Shaft Spring

characters which is a very critical function in the VariTyper machine.

The index head (Figure 3) consists of the index head casting, the top and bottom plates which are attached to the casting, and the index head pins and return springs which are supported between the plates.

The anvil assembly (Figure 14) is supported by the index head casting and consists of the anvil and shaft, anvil shaft spring and cotter pin, yoke, yoke

sleeve and yoke return spring, shaft screw, cover and knob.

The anvil is located and held in lateral position by the anvil locating pin (Figure 9-4) which is mounted in the index head casting and fits into a hole in either side of the anvil. The anvil can be raised, freed of the anvil locating pin, and turned to reverse its position. When this is done, the anvil shaft spring is compressed by the cotter pin which is housed in a hole through the bottom of the anvil shaft. This prevents the anvil from being pulled completely out of the index head and also serves as a return medium.

The anvil is raised by grasping the anvil knob which screws onto the anvil yoke hub. When there are type fonts in the anvil and the anvil is raised to reverse its position, the anvil yoke lifts first and locks the fonts in place to prevent their movement within the anvil. This will insure that the fonts will be properly positioned for the shuttle arm pin and idle pin to enter the type bushings when the anvil is lowered to operating position. When the knob is released, the yoke spring returns the yoke to rest position which releases the fonts.

In its lower case operating position, the anvil rests on the anvil height adjusting screw (Figure 9-9).

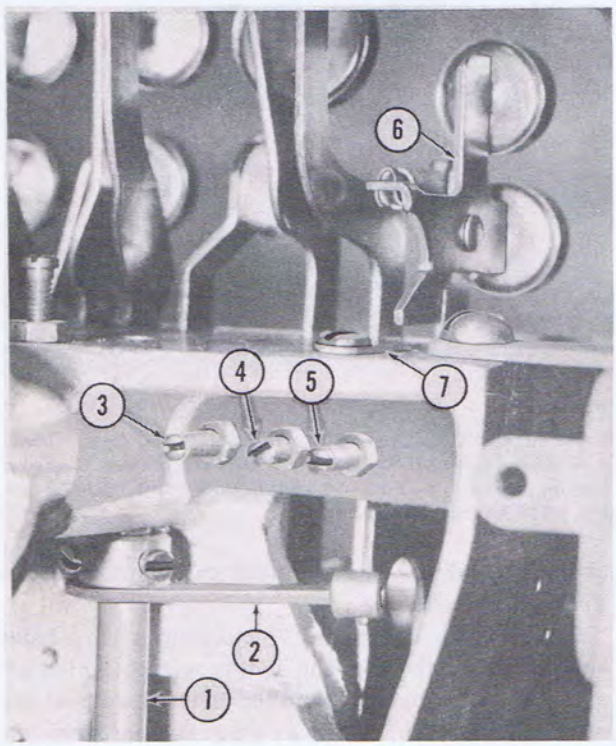


FIGURE 15

1—Back Space Rod 2—Back Space Lever, Front 3—Figure Shift Adjusting Screw 4—Capital Shift Adjusting Screw 5—Back Space Adjusting Screw 6—Back Space Keylever 7—Half Back Space Stop

Capital and Figure Shift Keys

One set of capital and figure shift keys are located at either side of the keyboard. The function of these levers is to raise the anvil from the lower case position to the capital or figure shift position. In so doing, the capital or figure row of characters on the type font is brought into printing position.

When a shift key is depressed, it rotates the anvil lift lever shaft (Figure 1-5). The anvil lift lever (Figure 1-7) is pinned to the shaft and is located

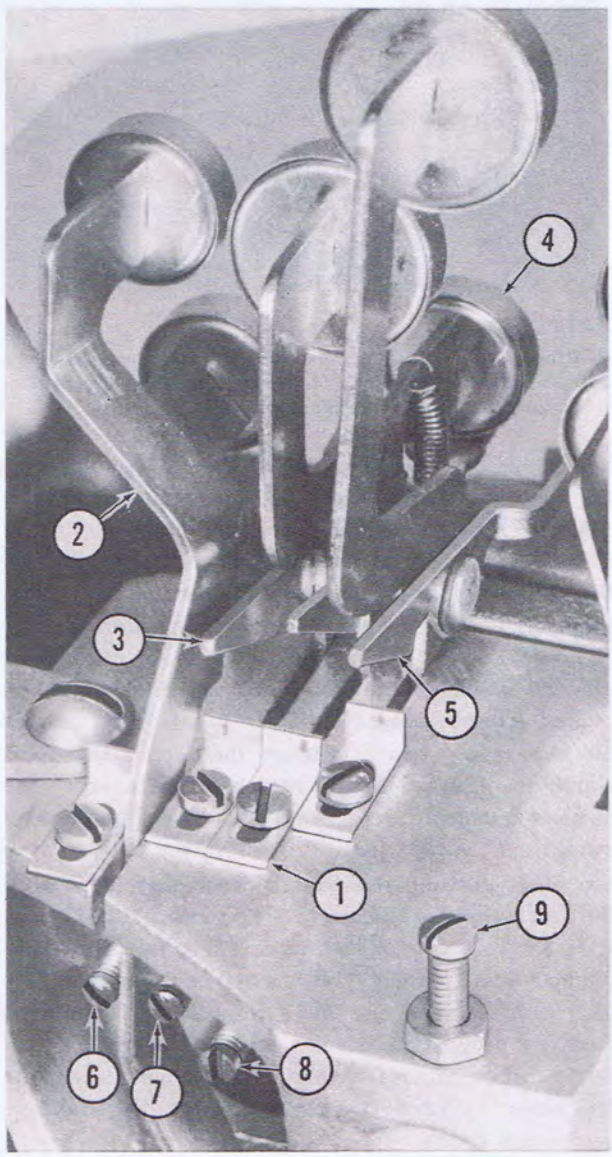


FIGURE 16

1—Capital and Figure Shift Lock 2—One-increment Space Keylever 3—Figure Shift Key Lock Lever 4—Type Change Keylever 5—Capital Shift Key Lock Lever 6—Figure Shift Adjusting Screw 7—Type Change Key Adjusting Screw 8—Capital Shift Adjusting Screw 9—Type Drawer Stop Screw

directly under the anvil shaft. As the shaft rotates, the lift lever is raised and in turn raises the anvil. The height to which the anvil will be raised is determined by the capital and figure shift adjustment screws. These screws are located in the machine frame (Figures 15,16) and limit the shift key stroke to the point where the base lines of the capital and figure characters will align with the base line of the lower case characters.

The left shift keys are equipped with manually operated lock levers (Figure 16) which, when engaged, will permit the anvil to remain in the raised position.

Type Change Key

The function of the type change key mechanism (Figure 16-4) is to raise and lock the anvil in its raised position so that type fonts can be inserted or removed. The type change key's anvil lifting function is the same as that of the capital and figure shift keys.

The type change key lock lever is spring operated and will automatically engage the lock when the key-lever is bottomed. Pressing the lock lever forward will disengage the lever from the lock permitting the anvil to lower to operating position.

Forms Attachment

The Forms Attachment (Figure 17) is used to automatically rule solid, hyphen leader, or dot leader lines.

The attachment consists of the motor and switch housing, solenoid mechanism, shut-off mechanism, and suppressor assembly. Type fonts used in forms ruling composition contain a Rule and Leader Line Segment in the center of the font. The segment has a three row arrangement in which three different rules can be printed. Selection of the desired rule on the segment is made through the operation of the capital and figure shift keys.

The motor and switch housing is attached to the right side of the machine case. The operating switch lever on the front of the housing cover can be moved to the right for a single hammer blow, and to the left for continuous hammer operation.

In the single stroke switch position, the forms solenoid circuit is closed, thereby energizing the

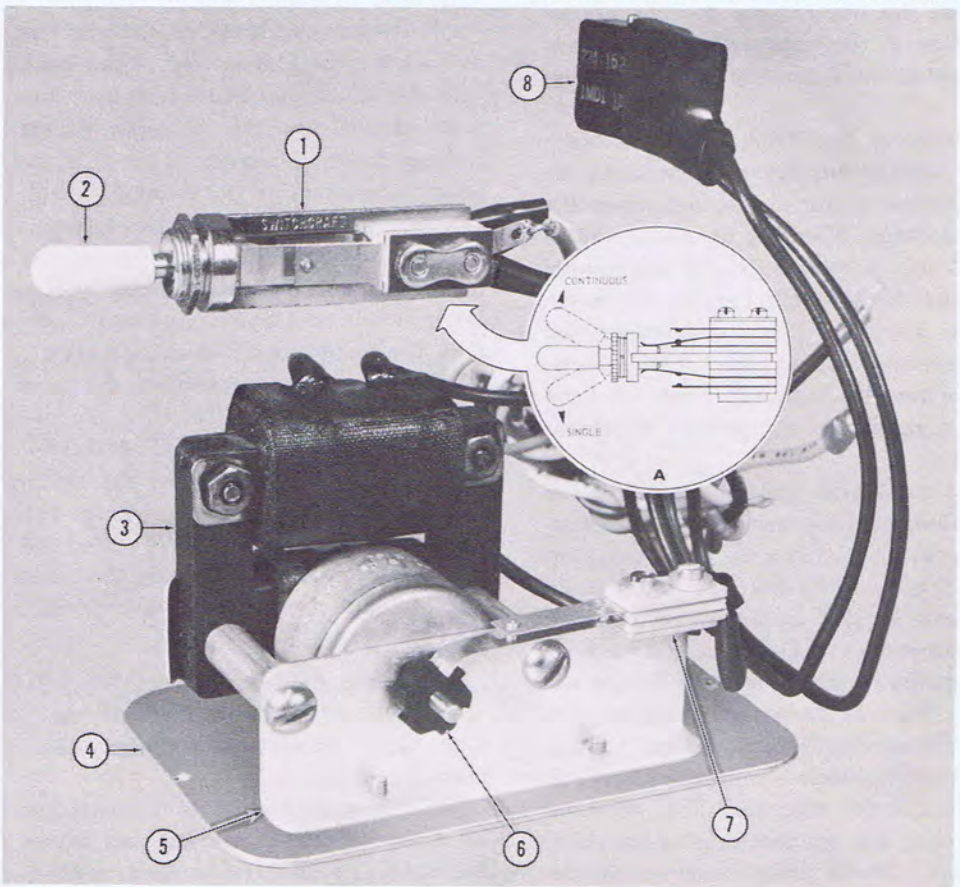


FIGURE 17

1—Toggle Switch 2—Toggle Switch Handle 3—Forms Attachment Motor 4—Base Plate 5—Motor Mounting Bracket 6—Cam 7—Cam Actuated Switch 8—Forms Cutoff Switch

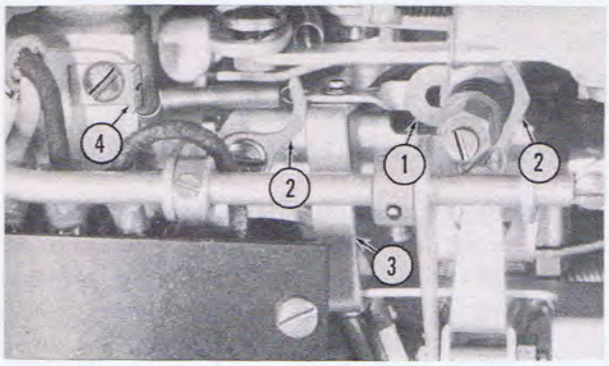


FIGURE 18

1—Forms Attachment Suppressor 2—Forms Attachment Bell Crank Stop 3—Forms Attachment Actuating Lever 4—Spring Bracket

solenoid. The solenoid assembly (Figure 22-6) is mounted on the machine frame underneath the motor box. The solenoid plunger is attached to the solenoid link which, in turn, operates the actuating lever. The actuating lever rotates on a stud attached to the machine frame and operates the escapement lever in the same way that the trip frame does in normal operation. Operation of the escapement lever leads to the regular escapement movement of the print phase.

The type positioning functions which normally occur in the print phase are bypassed because the hammer must strike the center of the font where the forms segment is located. When the operating switch lever is released, it returns to its unoperated position and breaks the solenoid circuit. A tension spring returns the actuating lever, connecting link and solenoid plunger to rest position. The escapement lever is then free to disengage itself from the escapement wheel resulting in carriage movement and hammer return.

Because of the small size and sharpness of the forms segment characters, the hammer blow is suppressed. This is accomplished by a two-step suppressor block (Figure 18-1) attached to the forms actuating lever and located between the machine frame and the hammer stop nut. During normal machine operation, the suppressor block remains in its unoperated position. When the forms actuating lever is actuated, the suppressor block is moved so that the step or thicker part of the block is positioned between the machine frame and the stop nut. This shortens the hammer stroke and reduces the force of the blow.

When the operating switch lever is moved to the left for continuous hammer operation, the forms motor circuit is closed causing the motor to operate. A cam (Figure 17-6) on the motor shaft operates the

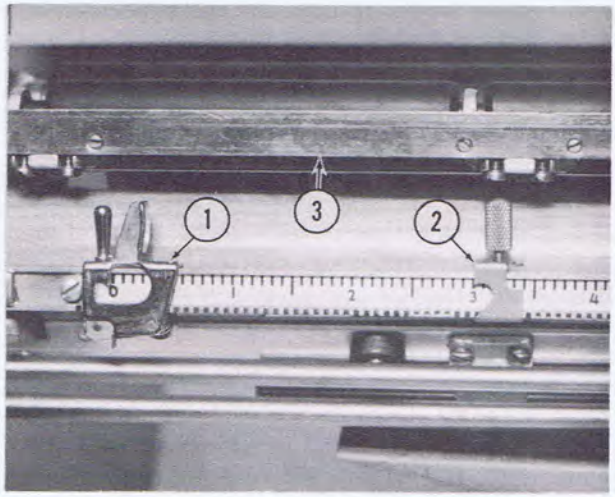


FIGURE 19

1—Margin Stop 2—Forms Shutoff Trip 3—Tie Rod

solenoid contact switch (Figure 17-7) which, when closed, completes the solenoid circuit and energizes the solenoid. When this occurs, the hammer is operated in the same manner as single stroke operation. As the motor continues to operate, the cam rotates and allows the bottom leaf of the contact switch to fall into a low part of the cam and breaks the solenoid circuit. As the solenoid plunger and forms linkage return to unoperated position, the escapement lever releases the escapement wheel resulting in carriage movement and hammer return. This cycle is repeated six times per second while the switch lever is held in continuous operation position. When the lever is released and returns to its unoperated position, the forms motor circuit is broken.

During continuous operation, the ruled line can be terminated automatically at a predetermined point by placing a shut-off trip (Figure 19-2) on the carriage margin scale rack. As the carriage moves to the left, the shut-off trip comes in contact with the shut-off switch (Figure 71) lever and opens a set of normally closed contacts in the switch. When this occurs, the solenoid and motor circuits are broken.

Ribbon Feed

The ribbon feed mechanism (Figure 13) consists of the ribbon feed shaft, ribbon feed pawl, ratchet stop, fabric ribbon feed assembly, and carbon ribbon feed assembly.

The ribbon feed shaft is supported in two bosses on the underside of the machine frame. Mounted on the shaft are the ribbon feed ratchet, ribbon feed gears, and the ribbon reverse gears.

The ribbon feed pawl (Figure 13-2) is supported on a short shaft attached to the hammer tail, and is

kept in engagement with the ratchet (Figure 13-1) by a tension spring. When the hammer comes forward to strike the type near the end of the print phase, the hammer tail positions the pawl down three or four teeth on the ratchet. As the hammer starts its return movement at the beginning of the carriage movement phase, the pawl rotates the ratchet and, consequently, the ribbon feed shaft.

The function of the ratchet stop (Figure 13-5) is to prevent movement of the ratchet when the hammer moves forward and positions the pawl. Such movement would result in reverse ribbon feed and incorrect positioning of the pawl in relation to the number of ratchet teeth which must be fed for proper ribbon feed.

The fabric ribbon cups are located on either side of the index head. The ribbon feed vertical shafts are connected to horizontal gears on the underside of the machine through a universal joint. As the ribbon feed shaft rotates, a gear on the shaft meshes with the pickup spool shaft gear and in this way, the ribbon is fed and wound on the pickup spool. When the pickup spool is filled, the ribbon must reverse its direction of feed and rewind on the empty spool.

The ribbon passes through a slot in the ribbon reverse arms. A metal eyelet near both ends of the ribbon is wider than the reverse arm slot and cannot pass through, thereby rotating the arm. The reverse lever, (Figure 65-3) which is attached to the end of the reverse arm shaft, is actuated by the rotation and is brought in contact with a collar on the ribbon feed shaft. As the reverse arm continues to rotate, the lever presses against the collar and moves the ribbon shaft. Movement of the shaft disengages the gears of the full spool and engages the gears of the empty spool which rotates and becomes the pickup spool.

Ribbon feed direction can also be reversed by moving the shaft manually by means of the ribbon feed shaft extension knob which is joined to the right end of the shaft and extends through the machine case. The ribbon feed knob is also used to feed ribbon manually.

The carbon paper ribbon feed mechanism (Figure 21) is attached to the right side of the machine casting. The ribbon cup plate is mounted inside the left side of the machine case and supports the ribbon cup reel in which the ribbon is installed.

As the ribbon feed shaft rotates, a gear on the shaft rotates the gear on the feed mechanism vertical shaft. The vertical shaft is connected directly to the large feed roller on top of the feed mechanism bracket. A tension spring on the underside of the bracket

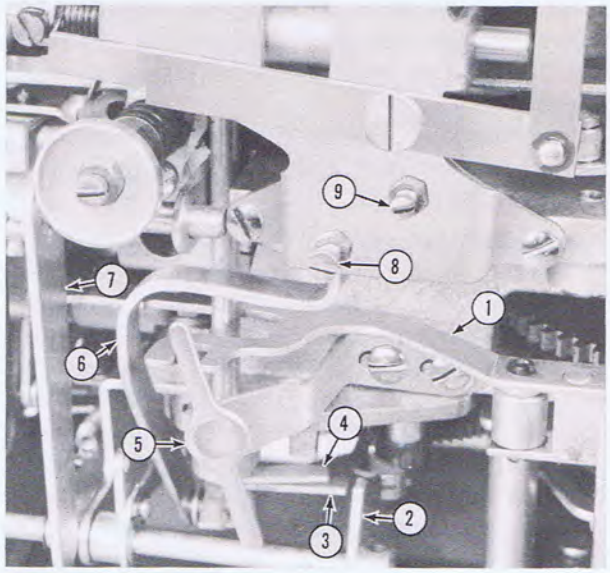


FIGURE 20

1–Forms Attachment Solenoid Link 2–One-increment stop 3–Two-increment Stop 4–Three-increment Stop 5–Forms Attachment Pivot Bracket 6–Tabulator Release Lever and Bracket 7–Repeat Shaft Lever 8–Tabulator Release Lever Adjusting Screw 9–Back Space Lever and Pawl Adjusting Screw

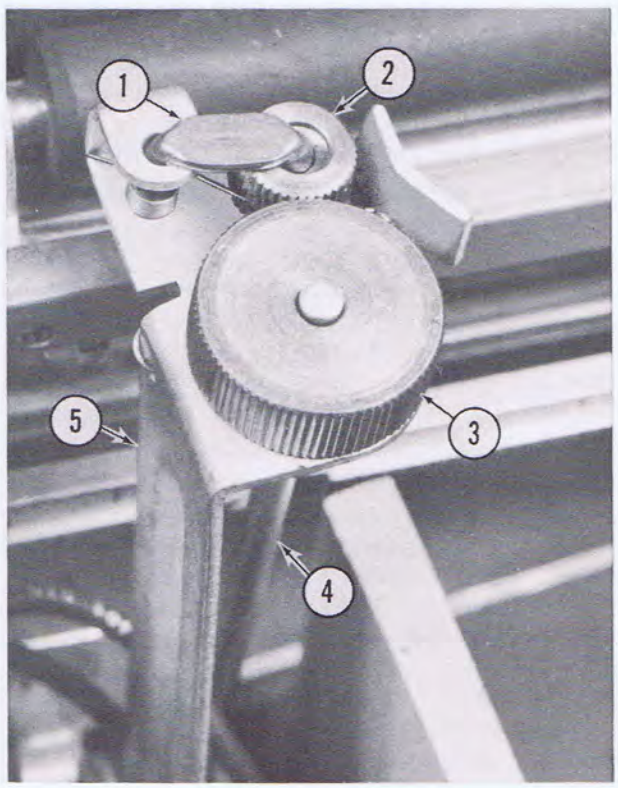


FIGURE 21

1–Carbon Paper Ribbon Tension Arm 2–Tension Roller 3–Feed Roller 4–Vertical Shaft 5–Carbon Paper Ribbon Bracket

holds the tension roller in contact with the feed roller. The ribbon is placed between the two rollers and the pressure and rotation of the rollers feeds the ribbon.

To operate the carbon paper ribbon feed mechanism, the ribbon feed shaft extension and knob must be pushed in.

Spacing Shift Assembly

The gear sleeve, as described previously, includes four spacing gears of different sizes which vary the horizontal spacing. The selection of any one of the four spacings is controlled by the shift lever on the right side of the machine. When the shift lever is depressed, it rotates the escapement shift shaft (Figure 34-1). This actuates the rack lift actuating lever (Figure 34-3) which is attached to the shift shaft and raises the rack lift lever (Figure 34-2). The rack lift lever disengages the carriage escapement rack from the gear sleeve and, while engaged with the rack, prevents the carriage from moving to the left.

The gear sleeve is moved on the escapement wheel shaft by the escapement shift fork (Figure 34-5) which is attached to the shift shaft. The opposite end of the fork engages the back space ratchet on the gear sleeve. As the shift lever is moved from one setting to another, the fork moves the gear sleeve and positions it so that the spacing gear on the sleeve which corresponds to the spacing selected by the shift lever will engage the carriage rack.

Back Space and Half-Back Space Mechanism

The back space and half-back space keys are mounted on the same function keylever. The rest of the back space mechanism consists of the back space rod (Figure 22-14), front and back levers, and back space lever and pawl (Figures 15-2, 22-9). The front and back levers are attached to the back space rod which is supported in the machine frame. One end of the lever and pawl assembly is attached to and pivots on a shoulder screw in the machine frame; the other end rests on the rear lever.

When the back space key is depressed, the keylever presses down on the front lever and rotates the back space rod. This action raises the rear lever and, in turn, raises the back space lever and pawl so that the pawl engages the back space ratchet (Figure 8-4) on the gear sleeve, rotating it back one space. The ratchet effect between the gear sleeve and the escapement shaft pawl allows the gear sleeve to rotate backwards without affecting other escapement parts.

When the half-back space key is operated, the key pivots on the function keylever and places an obstruction between the keylever and the machine frame. This restricts the keylever action to half of its normal stroke which results in moving the gear sleeve backwards only one half of a space instead of a full space. Because of this, the escapement wheel shaft pawl cannot enter the next tooth of the gear sleeve ratchet and, consequently, when the half back space key is released, the gear sleeve and carriage will return to their rest positions.

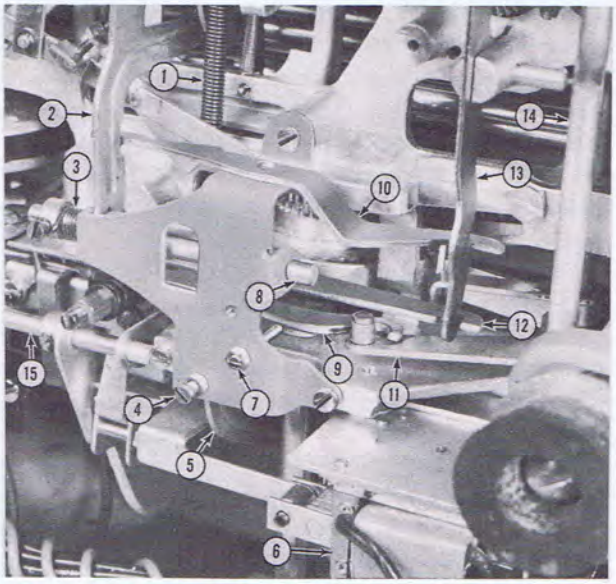


FIGURE 22

1—Hammer Spring 2—Tabulator Release Lever and Bracket 3—Torsion Spring 4—Tabulator Release Lever Adjusting Screw 5—Tabulator Release Lever and Bracket Rear Arm 6—Forms Attachment Solenoid 7—Back Space Lever and Pawl Adjusting Screw 8—Tabulator Pivot Shaft 9—Back Space Lever and Pawl 10—Tabulator Bracket Front Lever 11—Back Space Rear Lever 12—Tabulator Bracket Rear Lever 13—Tabulator Keylever 14—Back Space Rod 15—Repeat Lever Shaft

The half-back space function is used mainly in manual justification and centering of headings.

Tabulator Mechanism

The tabulator mechanism (Figure 22) consists of the tabulator function keylever, tabulator bracket, release lever and shaft, and tabulator reed (Figure 5).

The tabulator bracket assembly is attached to the underside of the machine frame and consists of the bracket, two actuating levers, and the release lever and shaft.

The tabulator reed is attached to the rear tabulator bracket actuating lever. When the tabulator function key is depressed, the rear lever is actuated and draws down the tabulator reed and positions it in the path of the tabulator stops which are inserted in the tabulator rack of the carriage assembly. The front actuating lever rests on the release lever, and

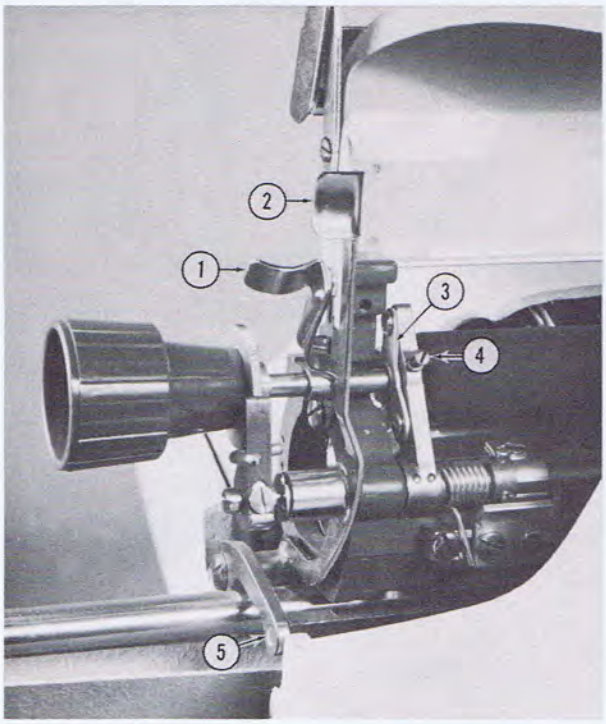


FIGURE 23

1—Feed Roll Opener 2—Carriage Release Lever 3—Feed Roll Setter 4—Feed Roll Setter Adjusting Screw 5—Escapement Rack

when the tabulator key is depressed, it rotates the release lever on its shaft. These two actions occur simultaneously.

The opposite end of the release lever is attached to the push rod (Figure 5) by means of the push rod head. When the release lever is rotated, it drives the push rod into the escapement wheel shaft and draws down the escapement wheel shaft pawl, disengaging it from the gear sleeve. This action frees the gear sleeve and permits it to rotate; consequently, the carriage is free to move to the left. When the tabulator stop comes in contact with the reed, the carriage is stopped. The keylever is then released, allowing the actuating levers to return to rest position. A torsion spring returns the release lever to rest position and in so doing, withdraws the push rod from the escapement wheel. This permits the shaft pawl to re-engage the gear sleeve and prevents further gear sleeve rotation and carriage movement.

Carriage Assembly

The function of the carriage assembly is to support the paper or other imaging material on which copy is to be typed.

The basic structure to which all other carriage assembly components are attached or supported by consists of the carriage ends, carriage center support, and carrier to which the carriage ends and carriage center support are securely attached. Mounted on the carrier are four ball bearing rollers which rest and roll on the carriage wayrod. The wayrod is attached to the machine frame and supports the entire carriage assembly. Two steady brackets which are attached to the carrier secure the carriage to the wayrod.

Vertical position of the carriage is maintained by the tie rod, which is attached to the upper front side of both carriage ends and center support, and the carriage front guide (Figure 9-2) which is attached to the index head casting and whose three rollers straddle the tie rod.

The carriage spring barrel (Figure 12-4) rotates on a shaft in the machine frame and supplies motive power to the carriage. The carriage draw band, which transmits the motive power to the carriage, is attached to the right carriage end.

The carriage escapement rack and carriage release rod (Figure 23) are attached to the carriage ends with shoulder screws. The rack is held in mesh with the gear sleeve by the rack tension lever. The carriage release rod is actuated by the carriage release levers. These levers are mounted on the ends of the large feed roll hanger shaft which is supported in both carriage ends. When either lever is operated, the tail of the lever rotates the release rod which actuates the tabulator release lever resulting in carriage movement.

The large feed roll is supported on the feed roll hangers which are attached to the feed roll hanger shaft. The small feed rolls (Figure 27) are supported in bearings which are attached to the carriage tie rod. The large feed roll is held tightly against the small rolls by four tension springs (Figure 25-3). Paper is fed up or down when the large feed roll is rotated manually by means of the feed roll knob, or fed up when the feed roll is rotated by means of the line spacing mechanism.

To insert or remove paper, the large feed roll is separated from the small rolls by the feed roll opener (Figure 23-1). This lever is supported and rotates on the right end of the large feed roll shaft. The bottom of the lever has two detents, one deeper than the other. A shoulder screw in the carriage end holds the lever in position, and a roller on the shoulder of the screw acts as a bearing for the lever detents. In its unoperated position, the deeper detent clears the shoulder screw roller, allowing the large feed roll to contact the small rollers. When the lever is

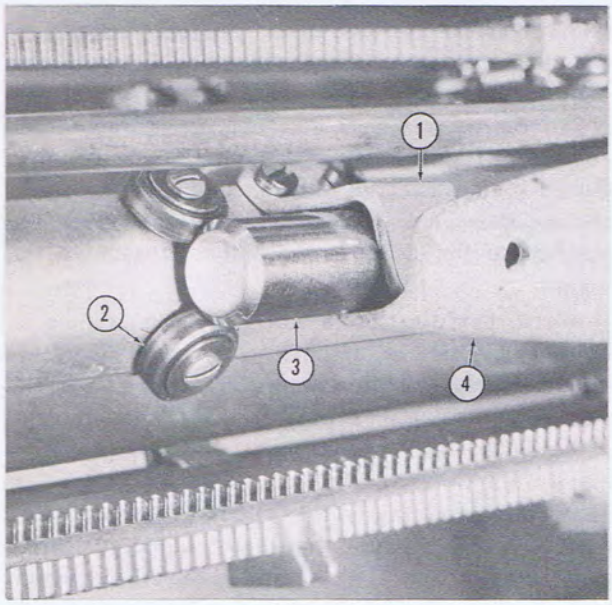


FIGURE 24

1—Steady Bracket 2—Ball Bearing Roller 3—Wayrod 4—Wayrod Support

pushed back, the shallower detent engages the screw roller and forces the large feed roll away from the small feed rolls. The feed rolls remain open as long as the opener is in its operated position.

When paper is inserted in the machine, the feed roll knob is turned counterclockwise or toward the front of the machine, thereby feeding the paper down into the paper basket. The paper basket is made of transparent plastic and is formed to conform to the shape of the carriage ends. The basket is mounted in the assembly by two supports, one attached to the hanger shaft with clamps, the other attached to the underside of the tie rod.

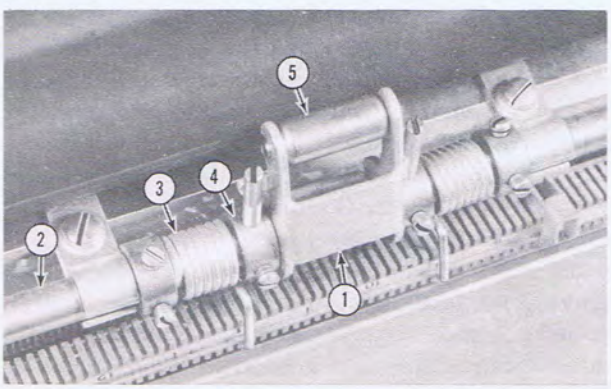


FIGURE 25

1—Feed Roll Support Bracket 2—Feed Roll Hanger Shaft 3—Torsion Spring 4—Torsion Spring Adjusting Collar 5—Feed Roll Support Bracket Roller

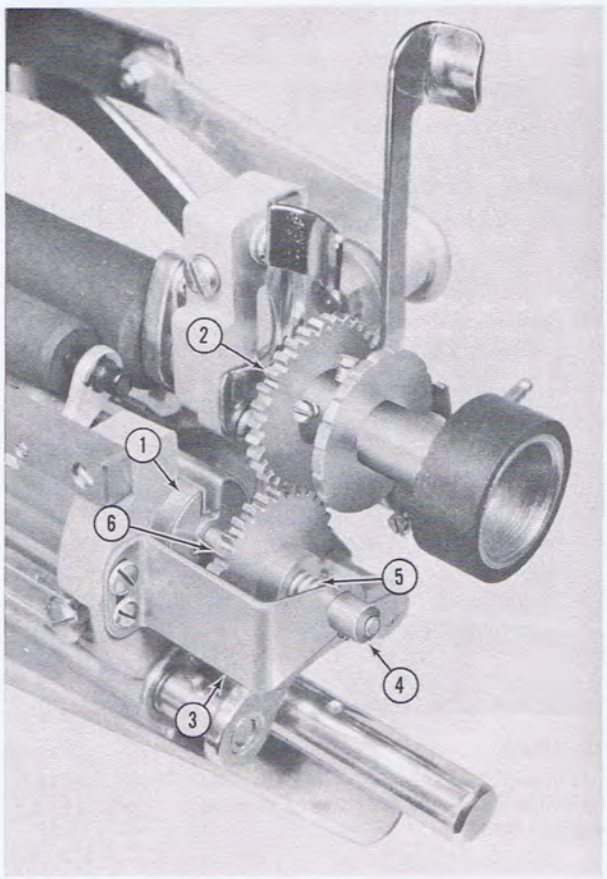


FIGURE 26

1—Auto-Wind Roller 2—Feed Roll Shaft Gear 3—Right Roller Bracket 4—Retaining Collar 5—Compression Spring 6—Auto-Wind Roller Shaft Gear

Auto-Wind Roller Attachment

The Auto-Wind Roller Attachment (Figures 26 and 27) replaces the split wooden roller used to insert paper masters and other imaging materials in VariTyper Composing Machines. The device is operated by means of a release lever (Figure 27-12) which opens and closes the Auto-Wind roller (Figure 26-1) and by the large feed roll through a simple gear train to actuate the roller. When the imaging material has been inserted in the carriage, and the Auto-Wind roller locked, the feed rolls are closed and turned with the feed roll knob as in normal operation. Rotation of the large feed roll actuates the Auto-Wind roller by means of the feed roll shaft gear and the Auto-Wind roller shaft gear (Figure 26-2, 6). The imaging material is, therefore, automatically wound around the Auto-Wind roller as it is being fed into the paper basket.

The Auto-Wind roller is suspended in the paper basket and is supported by brackets (Figures 26-3,

27-8) attached to the carriage ends. When the Auto-Wind Roller Attachment is in place, machine operators cannot take advantage of the open end carriage feature. Therefore, the attachment was designed for easy removal and re-installation by the machine operator to permit typing on imaging materials which extend beyond the length of the carriage.

Variable Line Spacer

The variable line spacer mechanism (Figures 27,28) is located on the left side of the carriage and its function is to control vertical line spacing.

Mounted on the left end of the large feed roll is the variable spacer assembly which consists of the variable spacer pawls and disc, friction washer, and feed roll ratchet and lock nut (Figure 29-4,5). This unit is supported on the feed roll shaft; the pawls extend into the body of the large feed roll.

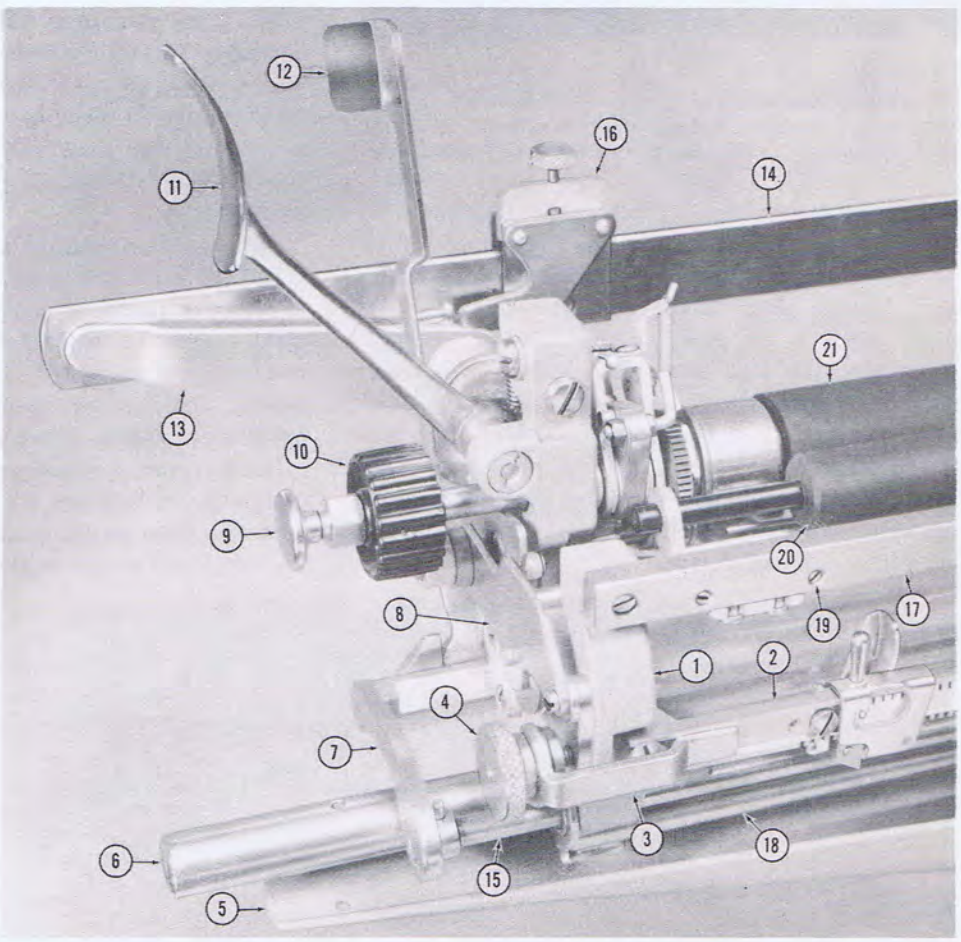
A push rod in the left end of the feed roll shaft actuates the variable spacer pawls. When the push rod is pulled out, it is disengaged from the pawls permitting the feed roll to be rotated while the feed roll ratchet remains stationary. When the push rod is pushed in, it engages the tips of the pawls and spreads them apart. The opposite ends of the pawls are attached to the disc and exert pressure on the variable spacer flange which forces the feed roll ratchet and lock nut against the friction washer and, in turn, against the disc. In this position, the feed roll and the variable spacer mechanism will turn as one unit.

The line feed lever is attached to the left carriage end and is connected to the feed roll ratchet pawl carrier by a swivel joint (Figure 28-6). When the line feed lever is operated, the movement of the lever is transmitted through the pawl carrier to the pawl which engages a tooth in the ratchet (Figure 28-2). With the push rod in, the pawl drives the ratchet which, through the variable spacer mechanism, rotates the feed roll. The feed roll ratchet spring, which is mounted on the left feed roll hanger, engages the ratchet and holds it in position while the ratchet is at rest.

The distance travelled by the pawl, and subsequent feed roll rotation, is determined by the line feed regulator (Figure 28-4). The regulator is set at one of five different settings, and as the pawl moves for-

FIGURE 27

1—Carriage End, Left
2—Margin Rack
3—Margin Rack Adjusting Stud Bracket
4—Margin Rack Adjusting Thumb Nut
5—Wayrod Support, Left
6—Wayrod
7—Escapement Rack
8—Roller Bracket, Left
9—Variable Spacer Push Rod
10—Feed Roll Knob, Left
11—Line Feed Lever
12—Auto-Wind Roller Release Lever
13—Actuating Bar Bell Crank, Left
14—Actuating Bar
15—Escapement Rack Guide Rod
16—Justifier Selector
17—Tie Rod
18—Carriage Release Rod
19—Feed Roll Bearing Adjusting Screws
20—Small Feed Rolls
21—Large Feed Roll



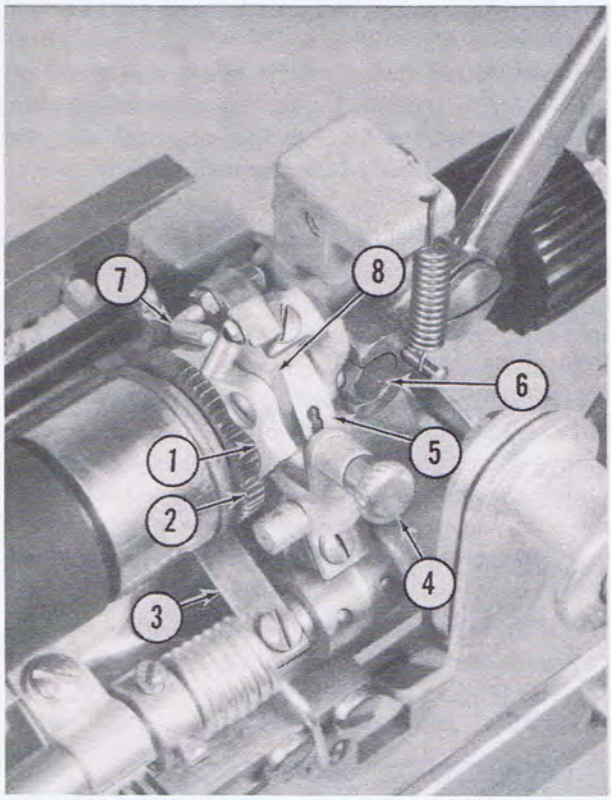


FIGURE 28

1–Feed Roll Ratchet Pawl 2–Feed Roll Ratchet 3–Feed Roll Ratchet Spring 4–Line Feed Regulator 5–Index Plate 6–Swivel 7–Stop Hook 8–Feed Roll Pawl Carrier

ward, it contacts the regulator and its travel is terminated. At this point, the paper has been fed up one line space. The five different line spacings which can be obtained from the standard feed roll ratchet are 9, 6, 4½, 3-3/5, and 3 lines to the inch.

When the line feed lever is released, a tension spring returns the lever and pawl carrier and pawl to rest position. Just before the pawl returns to full rest position, its tail contacts the pawl stop hook which disengages the pawl from the feed roll ratchet. This disengagement permits manual rotation of the feed roll in either direction.

VariLine Attachment

The VariLine Attachment (Figure 30) supplements the line spacings available on the variable line spacer. It consists of the VariLine Attachment bushing, gears, detent spring and spring holder, and knob.

The VariLine bushing is attached to the right end of the large feed roll shaft and supports the VariLine gear. The knob is screwed on the bushing and secures the gear.

The detent spring holder is mounted on the right end of the feed roll hanger shaft; the detent spring is attached to the holder by a screw. A lift lever is supported between the detent spring and spring holder and its purpose is to disengage the detent spring from the gear when the attachment is not being used. When in use, the attachment is operated by rotating the feed roll manually by means of the knob.

When using the VariLine Attachment, it is necessary to disengage the variable line spacer mechanism by pulling out the push rod. Only one line spacing mechanism can be engaged and operated – the other must be disengaged.

Automatic Justifier

VariTyper machines which are equipped with the automatic justifier mechanism are capable of producing copy with a justified or even right margin. This is accomplished by the addition of extra space to the regular word and character spaces in the line, thereby "stretching" the line to a predetermined length.

The procedure requires double typing. Each line is typed the first time to allow the justifier mechanism to determine how much space must be added to stretch the line to the desired length for which the mechanism was preset. In the second or justified typing, the justifier automatically distributes the extra space evenly between all words and characters.

The minimum and maximum column widths for which the justifier can be set are 1.9" and 7.4" respectively.

The justifier model carriage assembly differs from the non-justifier carriage assembly in one important

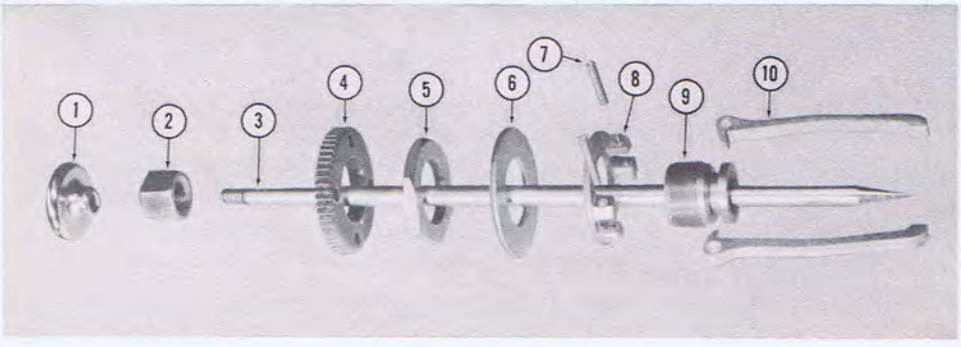


FIGURE 29

1–Variable Spacer Knob
2–Nut
3–Variable Spacer Push Rod
4–Feed Roll Ratchet
5–Adjusting Nut
6–Friction Washer
7–Pin
8–Variable Spacer Disc
9–Variable Spacer Flange
10–Variable Spacer Pawl

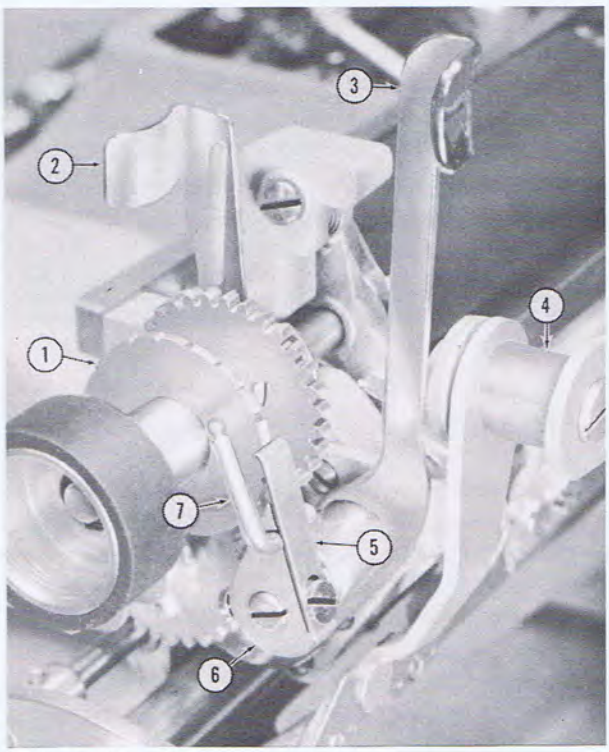


FIGURE 30

1—VariLine Gear 2—Feed Roll Opener 3—Carriage Release Lever, Right 4—Carriage Bell Crank 5—VariLine Detent Spring 6—Detent Spring Holder 7—VariLine Lift Lever

respect. Instead of the carriage escapement rack being attached to the carriage ends by shoulder screws, it is attached by means of a rod (Figure 27-15) which extends through the carriage ends and is attached to the rack ends. This, besides permitting the rack to be raised, allows the carriage to slide along the rod and assume a movement which is independent of the movement of the rack as determined by the gear sleeve. It is, therefore, possible to allow the entire carriage assembly to move one character space and, at the same time, allow the carriage to move in addition to the movement permitted by the carriage escapement rack. This double, simultaneous carriage movement is the underlying principle of VariTyper machine method of automatic justification.

The movement of the carriage on the carriage escapement rack is controlled by the actuating bar (Figure 31-8) which is supported on two bell cranks. The bell cranks are attached to and pivot on brackets which are attached to the carriage ends. The lower portions of the bell cranks are joined with the carriage escapement rack by means of lugs which hold the bell cranks in place. By lowering or raising the actuating bar, while the rack remains stationary, the carriage will move along the carriage escapement rack rod.

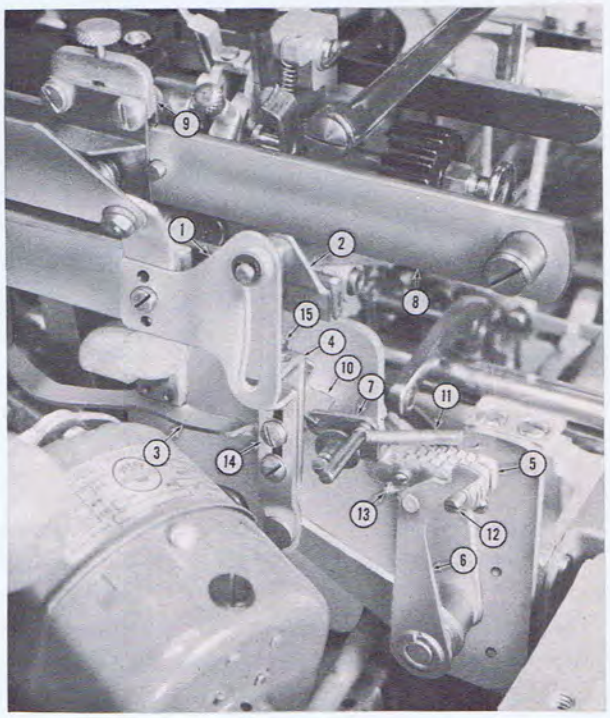


FIGURE 31

1—Sine Bar Guide 2—Sine Bar Cradle 3—Sine Shift Lever 4—Sine Bar Lifting Link 5—Sine Ratchet Assembly 6—Sine Shift Shaft Lever 7—Sine Ratchet Pawl 8—Actuating Bar 9—Justifier Selector 10—Sine Pawl Release Lever 11—Sine Ratchet Pawl Spring 12—Sine Ratchet Mounting Screw 13—Sine Shift Shaft Lever Adjusting Screw 14—Sine Bar Lifting Link Locking Screw 15—Sine Bar Lifting Link Adjusting Screw

During the first typing of the automatic justification process, the actuating bar is supported, in its unoperated position, on the horizontal track (Figure 32-5) by means of the justifier selector (Figure 32-4) which is mounted on the bar.

Attached to the left end of the horizontal track is the sine bar (Figure 32-2) whose angular position relative to the horizontal plane of the track determines the amount of additional movement of the carriage. The position of the sine bar is determined by the sine ratchet (Figure 31-5) and is directly related to the length of the unjustified line.

The sine ratchet is supported on the sine shift shaft (Figure 31-6) and is actuated by a lever attached to the end of the shaft. Attached to the opposite end of the shaft is the justifier center slide (Figure 33-1) which is operated by the margin stops. As the carriage moves toward the left during machine operation, the right (removable) margin stop contacts the center slide and carries it along in the same direction. The movement of the center slide rotates the sine shift shaft and its lever moves the

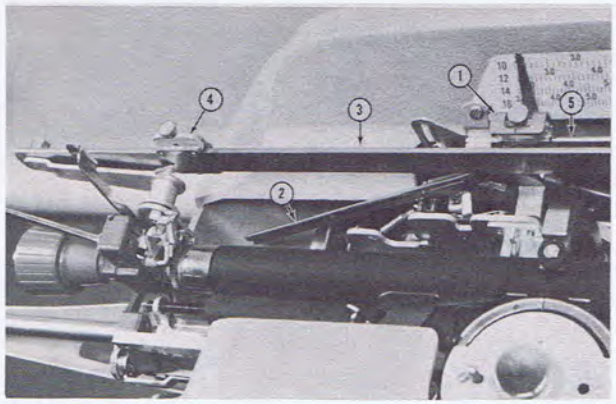


FIGURE 32

1—Column Selector 2—Sine Bar 3—Actuating Bar 4—Justifier Selector 5—Horizontal Track

sine ratchet which raises the sine bar. The ratchet moves one tooth for each space that the carriage moves.

The justifier dial indicates the justifying area (minimum and maximum line lengths which can be justified). The typed line can be terminated anywhere between the first and last graduations on the dial.

After the rough (unjustified) line has been typed, the tabulator key is operated bringing the carriage into justifying position. This is the point where the second or justified typing starts.

In making the justifier settings, as described in the operator's manual, the justifier selector is positioned so that after tabulating it will line up with the beginning or right end of the sine bar. As the carriage moves to the left, it moves the regular

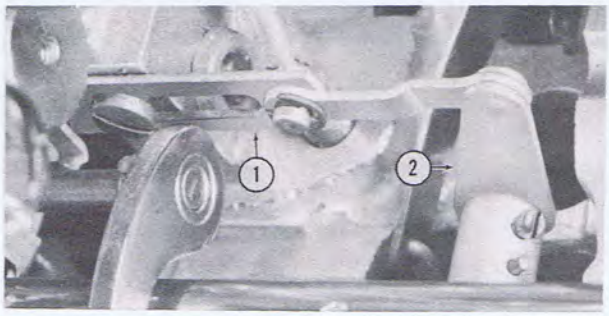


FIGURE 33

1—Center Slide 2—Sine Shift Shaft Actuating Lever

character and space bar spaces plus the extra move-it will gain from the actuating bar moving down the inclined sine bar. The sine ratchet supports the weight of the carriage and is kept from falling back by the ratchet pawl (Figure 31-7) which engages the ratchet teeth.

When the justified line is completed and the carriage is returned, the margin stop contacts the center slide and carries it back to rest position. As this action occurs, the sine shift shaft is rotated back to its unoperated position causing its lever to raise the ratchet pawl which releases the ratchet and permits it to return to unoperated position. The justifier dial pointer is also returned to zero by the center slide.

The sine ratchet consists of four individual ratchets—one for each of the horizontal spacings. When the horizontal spacing control is moved, the escapement shift fork moves a link which is attached to the sine shift lever which, in turn, moves the ratchet pawl to the corresponding sine ratchet.

Differential Spacing Machines

The character spacing principle employed in the differential spacing VariTyper machine differs from that of the unit spacing model in that all characters do not occupy the same amount of space.

There are three character space categories into which all characters fall—namely; two, three, and four increments or, in terms of the basic character space, 2/3, 3/3, 4/3 of a character space. Letters such as lower case i, f, and t, occupy two increments; lower case a, b, and c occupy three increments; upper case D, E, and F are allotted four increments.

There is a one increment space which is used in the same manner as a function or space bar space. None of the DS type fonts are designed to use the one-increment space as a character space except for those fonts used in the VariTyper Models 519 and 565 which are specially designed for this purpose. (See VariTyper Models 519 and 565, page 27.)

Differential spacing is accomplished through the use of two escapements—the hammer escapement which performs the same functions as the unit spacing escapement, and the carriage escapement which controls the movement of the carriage (Figure 34).

When a keylever is operated, in addition to its basic functions (operation of driver lever and arm, trip frame, index pin, etc.) it operates a code bar which is located directly above the lever and is housed in the coder. The coder consists of thirty code bars, one for each character keylever of the

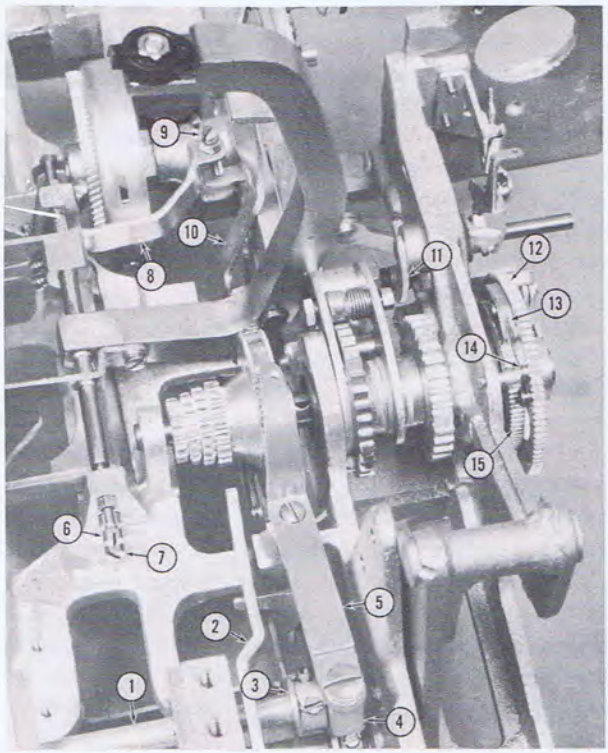


FIGURE 34

1–Spacing Shift Shaft 2–Rack Lift Lever 3–Rack Lift Actuating Lever 4–Fork Bushing 5–Spacing Shift Fork 6–Hammer Pivot Screw 7–Trip Frame Pivot Screw 8–Trip Frame 9–Overall Touch Adjusting Screw 10–Tabulator Reed 11–Flying Dog Actuating Lever Shaft Cam 12–Carriage Escapement Wheel 13–Carriage Pinion Pawl 14–Pawl Spring 15–Escapement Shaft Ratchet

keyboard. Each of the thirty code bars is coded to select the proper increment category for the character being typed whether it is in the lower, capital or figure shift position. For instance, the No. 10 keylever in the lower case position ("r") occupies two increments of space; in the capital shift position ("R"), it occupies four increments; in the figure shift position ("4"), it occupies three increments. The same code bar, therefore, selected three different increment spaces to coincide with the different widths of the three characters printed. This selection principle is true of all the code bars although some of them select the same increment category for the three shift positions, while others will select only two **categories.**

The selection of the proper increment space is accomplished through the operation of two code bar bails (Figure 36-8,9). The bails are supported in the coder brackets and rest above the code bars. When a code bar is operated, it raises none, one, or both of the bails, depending on the increment spacing to be selected. The bails are connected by links to the increment stop shafts (Figure 37) which, when rotated by the link, position the increment stops in the carriage escapement to give the correct amount of carriage movement. When at rest, the stops (Figure 39-7,8) are in the engaging position. When a two-increment character is struck, the two-increment stop functions. When a three-increment character is struck, the code bar for that character raises the two-increment (front) bail, and through the bail link and increment stop shaft, the two increment stop is removed from its operating position, permitting the three-increment stop to function. When a four-increment character is typed, the code bar for that character raises both the two and three-increment bails, thereby removing the two and three-increment stops from their operating position allowing the escapement to move the maximum distance.

The coder (Figure 73) is a self contained unit and can be removed from the machine by the machine operator just as easily as removing a type font from the anvil. Other coders can be inserted in the machine in which the coding combinations are different. Example: an English coder can be removed and a Greek coder inserted in its place. These coders differ from the standard English coder in that the type font keyboard arrangements differ, therefore the coding combinations are arranged to coincide with the keyboard

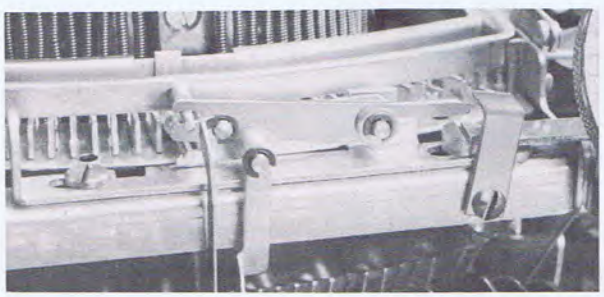


FIGURE 35 BAIL LEVERS (Engaged)

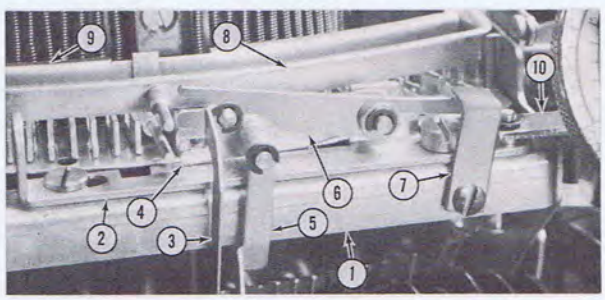


FIGURE 36

1–Tie Plate 2–Unit Slide 3–Two-increment Bail Lever Link 4–Three-increment Bail Lever 5–Three-increment Bail Lever Link 6–Two-increment Bail Lever 7–Standard Shift Cam 8–Front Bail 9–Rear Bail 10–Standard Shift Arm

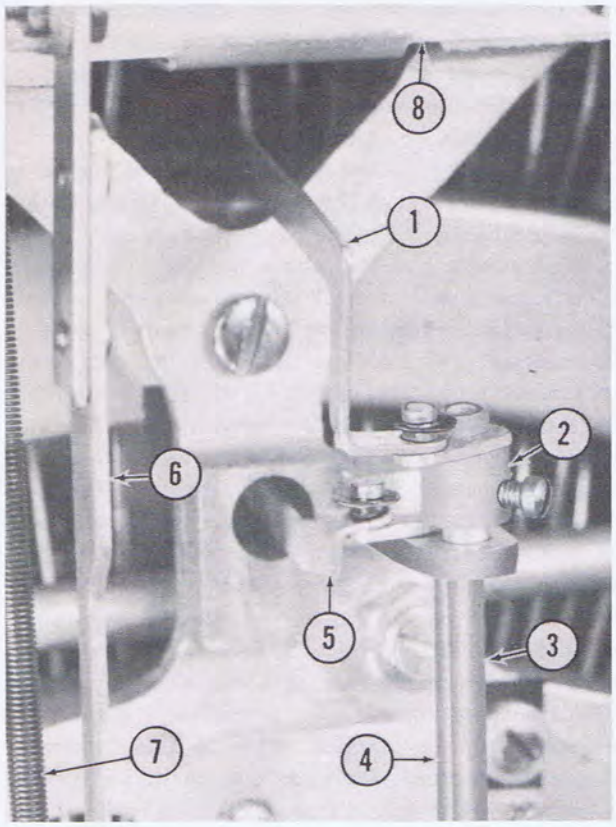


FIGURE 37

1—Three-increment Bail Lever Link 2—Three-increment Stop Shaft Lever and Hub 3—Three-increment Stop Shaft 4—Two-increment Stop Shaft 5—Two-increment Bail Lever Link 6—Space Bar Holder Link 7—Space Bar Holder Link Return Spring 8—Space Bar Bracket

arrangement. If a standard English coder were to be used with a Greek type font, the spacing for the Greek characters would be incorrect, just as an English type font would space incorrectly if a Greek coder were to be used with it.

Early DS models have a fixed coder instead of the removable type. Although the operating principle of increment selection is basically the same, it was impractical to design foreign language or special type fonts in any coding combinations besides those combinations used in English fonts. If a special combination of codes became necessary to use a special font, the individual code bars could be changed to permit use of the type, but it was a rather involved adjustment which could not be made by the machine operator at will. Therefore, a machine which was specially coded usually remained that way and was used only for the particular application for which it was modified.

When the standard shift arm (Figure 36-10), located on the right side of the machine, is pulled out the arm disengages the bails from the bail links. In the process of disengagement, the two-increment bail link is operated and removes the two-increment stop from operating position. The code bar bails no longer relay the increment selection to the increment stops and the carriage moves three increments for all characters. The machine has, therefore, reverted to unit spacing, allowing each character the same amount of space. In this setting, only unit spacing type fonts can be used since all DS fonts are designed for use at differential spacing only.

Differential Spacing Escapement

The differential spacing escapement (Figure 38) shaft is supported by the hammer escapement wheel and the carriage escapement bracket which is mounted on the rear of the machine frame.

Mounted on the escapement shaft is the escapement shaft ratchet which is keyed to the shaft, and the carriage escapement wheel which rotates on the shaft. The ratchet and wheel are secured on the shaft by a flat-head screw in the end of the shaft.

A pawl on the carriage escapement wheel engages the escapement shaft ratchet causing the ratchet and wheel to turn as a unit when the shaft rotates clockwise (viewed from rear of machine) during carriage movement. When the shaft rotates counterclockwise (carriage return), the shaft ratchet turns with it, but the wheel remains stationary.

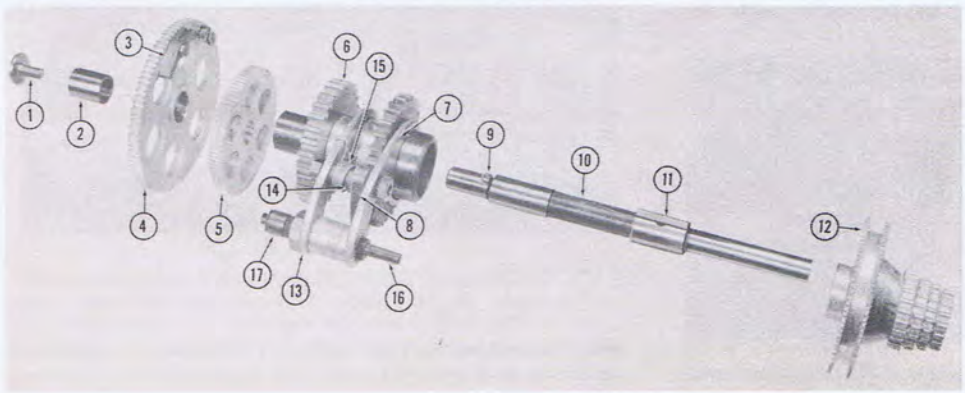


FIGURE 38

1—Screw 2—Spacer 3—Carriage Escapement Wheel Pawl 4—Carriage Escapement Wheel 5—Escapement Shaft Ratchet 6—Hammer Escapement Wheel 7—Hammer Lever, Front 8—Escapement Wheel Pawl 9—Pin 10—Carriage Escapement Shaft 11—Escapement Shaft Spline 12—Gear Sleeve 13—Hammer Lever, Rear 14—Escapement Wheel Pawl Shaft 15—Pawl Spring 16—Hammer Eccentric Screw 17—Hammer Eccentric Screw Roller

The hammer escapement wheel rotates freely on the escapement shaft and performs the same function as its equivalent in the unit spacing models. The gear sleeve, however, is keyed to the escapement shaft and is completely independent of the escapement wheel. Therefore, the gear sleeve, escapement shaft, and escapement shaft ratchet turn as one unit to provide carriage movement.

The carriage escapement is held in unoperated position by the flying dog (Figure 39-2) which serves the same purpose as the escapement wheel pawl in the hammer escapement. The gear sleeve is under constant tension exerted by the carriage through the carriage spring barrel and carriage band. This tension is transmitted through the escapement shaft to the shaft ratchet and through the ratchet pawl to the carriage escapement gear. The flying dog, which is supported in the escapement wheel hub, engages the escapement wheel and holds it in unoperated position.

The flying dog actuating lever (Figure 39-1) is mounted on a shaft which is supported in the carriage escapement bracket. Also mounted on and pinned to the shaft is the flying dog actuating lever arm. On the end of the actuating lever shaft is a cam which rests against a roller on the end of the hammer eccentric screw. This contact is maintained by the tension exerted by the actuating lever arm spring. When the hammer is released by the hammer escapement at the end of the print phase, the eccentric screw moves up and the actuating lever shaft cam follows it. This action causes the shaft to rotate, thereby allowing the actuating lever arm to move. The arm contacts the flying dog actuating lever and pivots it on the shaft, bringing it into contact with the top of the flying dog. This action forces the flying dog out of the wheel but before the dog is completely disengaged, the blade of the actuating lever enters the wheel and replaces the dog's restraining function, thereby preventing the escapement from rotating. The functions of the flying dog and flying dog actuating lever are similar to those of the escapement actuating lever and escapement pawl in the hammer escapement.

When the flying dog is released from the carriage escapement wheel, it is pulled to the right (viewed from rear of machine) by the flying dog spring, positioning the tail of the dog against the increment stop if the letter being typed is a two or three-increment character. If it is a four-increment character, the tail of the dog will bypass the increment stops and come to rest against the four-increment stop. Whichever position the flying dog assumes, it is representative of the number of escapement wheel teeth which the

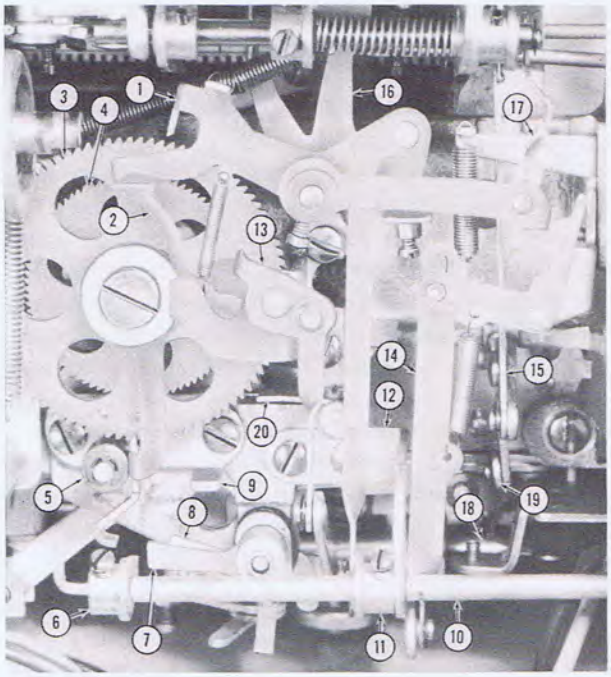


FIGURE 39

1–Flying Dog Actuating Lever 2–Flying Dog 3–Carriage Escapement Wheel 4–Escapement Shaft Ratchet 5–Flying Dog Stop 6–One-increment Stop 7–Two-increment Stop 8–Three-increment Stop 9–Four-increment Stop 10–One-increment Space Shaft 11–One-increment Lever Arm 12–One-increment Space Shaft Bracket, Right 13–Flying Dog Release Lever 14–Repeat Latch 15–Bell Crank Connecting Link 16–Flying Dog Actuating Shaft and Lever 17–Bent Link 18–Repeat Lever Shaft 19–Space Bar Bell Crank 20–Anti-Backlash Spring

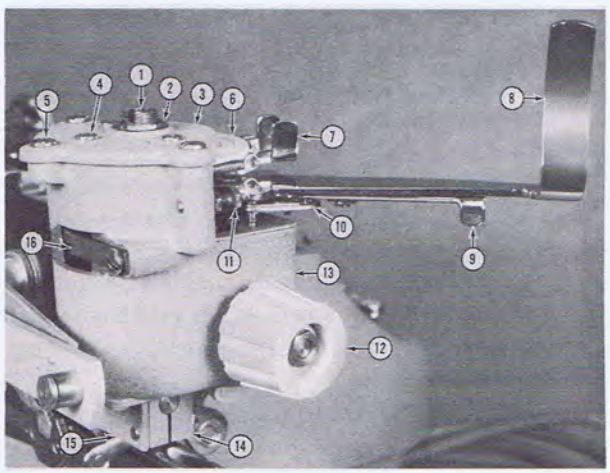


FIGURE 40

1–Screw Bushing 2–Nut 3–Linomatic Cover 4–Linomatic Dial Mounting Screw 5–Linomatic Cover Mounting Screw 6–Linomatic Dial 7–Indexing Handle 8–Feed Lever 9–Shift Arm 10–Pawl 11–Feed Lever Stop Screw 12–Feed Roll Knob, Left 13–Linomatic Housing 14–Linomatic Mounting Block 15–Linomatic Mounting Bracket 16–Ratchet Spring

blade of the dog has moved across, each tooth being the equivalent of one increment. For example: if a three-increment character is typed, the dog will be disengaged and skip by two escapement wheel teeth and position itself just before the third tooth.

After the character is printed and the keylever is released, the hammer returns to rest position. The action of the hammer and the hammer eccentric screw returns the actuating lever shaft cam to rest position. As the actuating lever shaft is rotated, the actuating lever arm is returned to rest position. As this occurs, the flying dog actuating lever is returned to rest position by the return spring. At the same time that the actuating lever releases the escapement wheel, the flying dog engages it. The escapement is then free to rotate and as it does, the flying dog is carried to the dog stop roller which stops the dog and, consequently, carriage movement.

The carriage escapement can be operated independently of the hammer escapement resulting in carriage movement without hammer action through operation of the space bar and one-increment space key. Both functions ultimately actuate the carriage escapement through links and levers connected with their operation.

Repeat Key

The repeat key operation on the DS machine is opposite to that of the unit spacing machine in that the repeat key is held down and the character key is repeated. As the repeat key is depressed, the repeat lever link rotates the repeat lever shaft (Figure 39-18). As the shaft rotates, the lever on the shaft pulls the repeat latch (Figure 39-14) against the rear arm of the flying dog actuating lever. As the flying dog actuating lever is actuated, the rear arm raises and the repeat latch slips under the lever and holds the actuating lever blade engaged in the escapement wheel. When the character keylever is depressed, the hammer operates normally but the carriage escapement does not operate.

When the repeat key is released, the tension spring draws the latch away from the actuating lever allowing the escapement to move.

One and Three-Increment Back Space Mechanism

The operating principle of the one and three-increment back space mechanism is the same as on the unit spacing machine, the only difference being that the back space ratchet on the gear sleeve has 90 teeth.

As the one-increment back space lever is depressed, the back space pawl moves the carriage back one increment. The carriage escapement wheel remains stationary, but the escapement shaft ratchet rotates and the ratchet pawl engages the next tooth. When the three-increment lever is depressed, the ratchet moves three teeth.

Linomatic Assembly

The two-way Linomatic assembly (Figures 40-41) used on DS models replaces the variable line spacer mechanism used on the unit spacing models. Other than this, the carriage assembly is the same on both models.

The mechanism is mounted on the left end of the feed roll hanger shaft and is capable of feeding paper up or down from 1/2 to 18 points in 1/2-point graduations.

The Linomatic dial and index gear are attached to the cover of the housing. The indexing swivel rotates on the main shaft, and the index handle is mounted in a slot in the swivel and is held engaged with the index gear by a tension spring.

The main shaft is positioned vertically in the housing. Fixed on the shaft are the forward and reverse feed gears, the check ratchet, and the feed roll actuating gear.

The feed lever rotates on the hub of the index swivel. The forward and reverse gear pawls are mounted on the bottom of the feed lever and the position in which the pawl shift lever is set determins which pawl will engage its respective feed gear.

The actuating gear on the main shaft meshes with the feed roll shaft gear and, through a clutch assembly at the end of the feed roll shaft, rotates the feed roll.

The clutch is engaged by pushing in the left feed roll knob and rotating it clockwise. As the knob is tightened, the two-piece bushing inside the knob is tightened against the feed roll shaft bushing. The bushing drives a washer against the feed roll shaft gear which, in turn, is pressed against the collar pinned to the feed roll shaft. As the main shaft is rotated, the feed roll actuating gear turns the feed roll shaft gear and the pressure between the gear and pinned collar causes the feed roll shaft to rotate. A detent spring mounted on the housing engages the forward feed gear and prevents movement of the mechanism during machine operation.

When the clutch is engaged, the feed roll cannot be turned manually. When the left feed roll knob is turned counterclockwise, a compression spring keeps the knob away from the housing so that only the outer section of the bushing engages the knob.

In this position, the clutch is disengaged, enabling the feed roll to be free rolled in either direction.

One-Way Linomatic Assembly

Differential Spacing machines manufactured before

October 1956 are equipped with the One-Way Linomatic Assembly. The mechanical principle is the same as the two-way assembly except that the one-way assembly will only feed paper up; reverse feed must be done by free rolling the feed roll with the clutch mechanism disengaged.

The main shaft is mounted horizontally in the housing instead of vertically as in the two-way assembly.

Automatic Justifier

Differential spacing justification differs from the unit spacing method in that the typed line is stretched to a pre-determined length by the insertion of additional space between words only, and not between letters and words as in the unit spacing method. This is necessary to preserve the proportionally spaced characteristic of differential spacing machine composition. For this reason, space bar operation is of utmost importance and is utilized to set up the justifying mechanism during rough copy operation.

Space bar action is transmitted to the justifier operating shaft (Figure 42-10) by means of the space bar holder link (Figure 37-6), space bar bell crank (Figure 39-19), and space bar bell crank connecting link (Figure 39-15).

The justifier operating shaft is located under the justifier cam bracket and is rotated by the space bar bell crank connecting link each time the space bar is operated. When rotated, the feed ratchet operating lever, which is pinned to the shaft, actuates the feed ratchet (Figure 43-1) which advances the cam follower (Figure 43-2) one tooth on the check ratchet

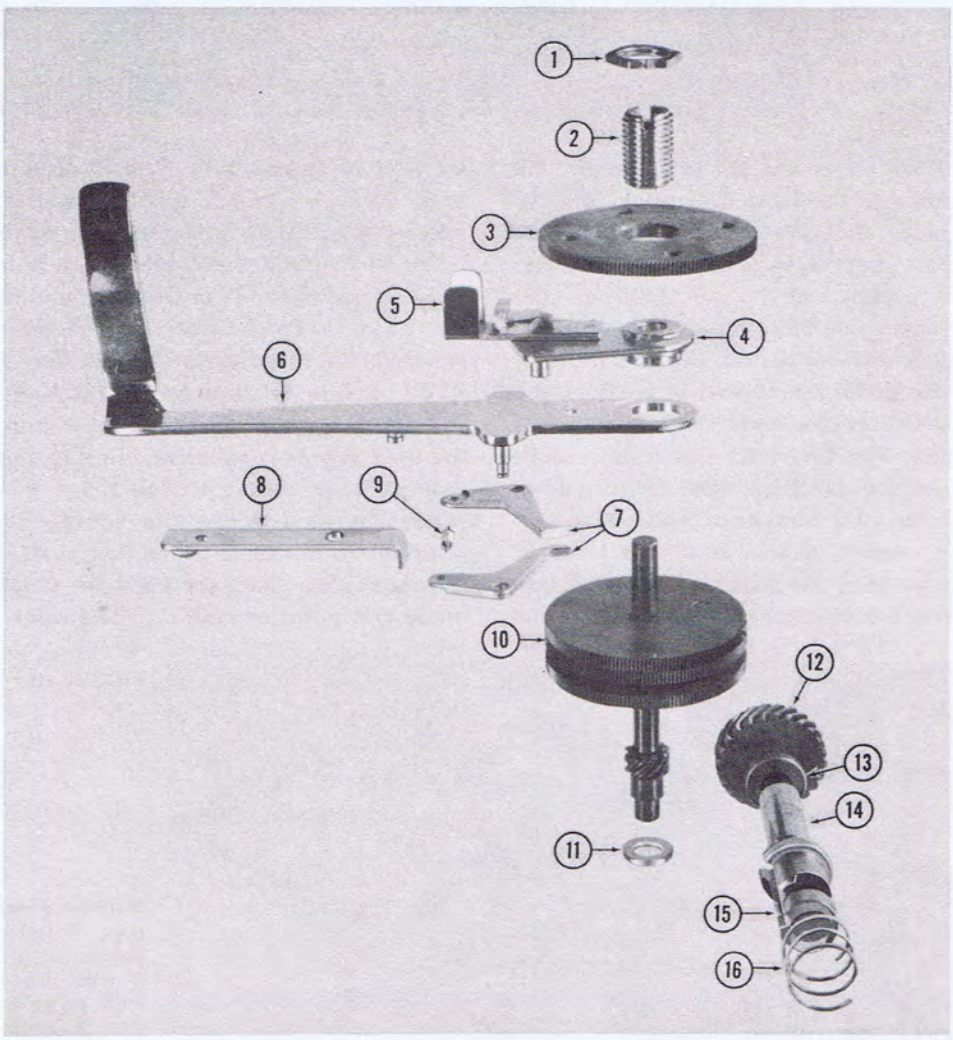
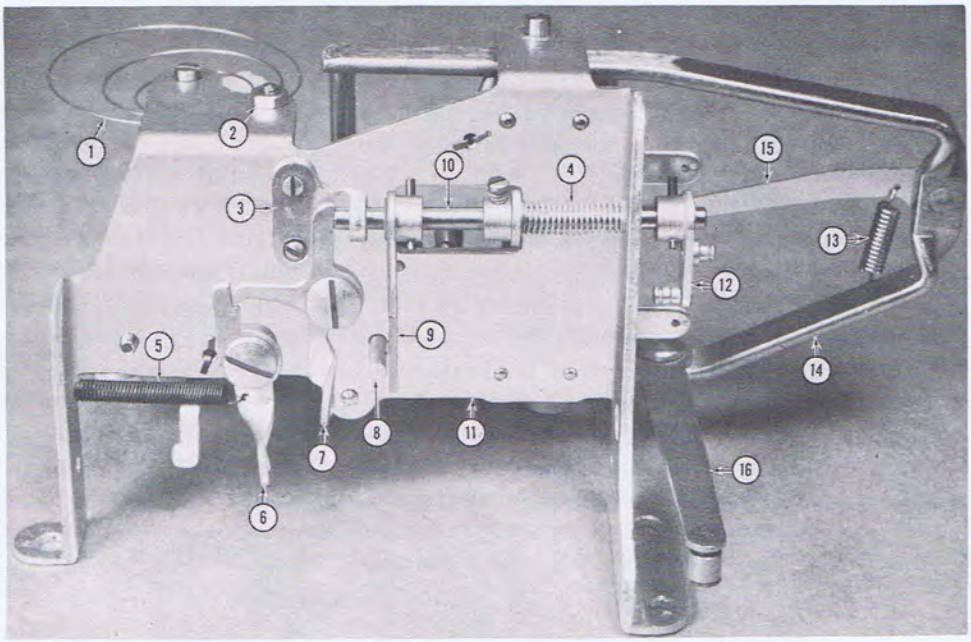


FIGURE 41

1–Nut 2–Bushing 3–Index Gear 4–Indexing Swivel 5–Indexing Handle 6–Feed Lever 7–Pawl 8–Shift Arm 9–Spring 10–Gear and Shaft 11–Spacer 12–Worm Gear 13–Washer 14–Bushing 15–Knob Bearing 16–Spring

FIGURE 42



1—Justifier Cam Return Spring 2—Justifier Cam Return Spring Lock Nut 3—Justifier Cam Operating Shaft Bearing 4—Justifier Cam Operating Shaft Compression Spring 5—Cam Reset Lock Spring 6—Cam Reset Lock 7—Cam Reset Lever 8—Justifier Bell Crank Link 9—Justifier Bell Crank Link Actuating Lever 10—Justifier Operating Shaft 11—Justifier Cam Bracket 12—Justifier Operating Shaft Actuating Lever 13—Justifier Cam Follower Return Finger Spring 14—Justifier Cradle 15—Justifier Cam Follower Return Finger 16—Cradle Reset Arm

(Figure 43-3). When the space bar is released, the feed ratchet returns to unoperated position, but the check ratchet holds the cam follower in position. On the next and all successive space bar operations, the same action occurs and the cam follower continues to be advanced one tooth for each operation.

When the rough line is completed, the cam follower will have been advanced the number of teeth on the check ratchet which corresponds to the number of spaces in the line. The tip of the cam follower will be positioned on the justifier cam (Figure 43-4) over the file of steps the number of which also corresponds to the number of spaces in the line. At this point, the justifier mechanism "knows" how many spaces there are in which additional space can be inserted to justify the line. It does not now, however, know how much space to add since lines of varying lengths can have the same number of spaces.

The mechanism which determines how much space is to be added to the regular two-increment space is the proportional bar slide (Figure 44-12). This assembly is mounted on the justifier cradle (Figure 43-5) and is actuated by the justifier setting shaft and arm (Figure 44-6) which is, in turn, actuated by the justifier setting slide. During the rough copy typing, when the justifying range is reached, the removable stop moves the setting slide which is attached to the justifier setting shaft. As the shaft is rotated, the shaft arm pulls the proportional slide along the justifier cradle. The longer the line, the

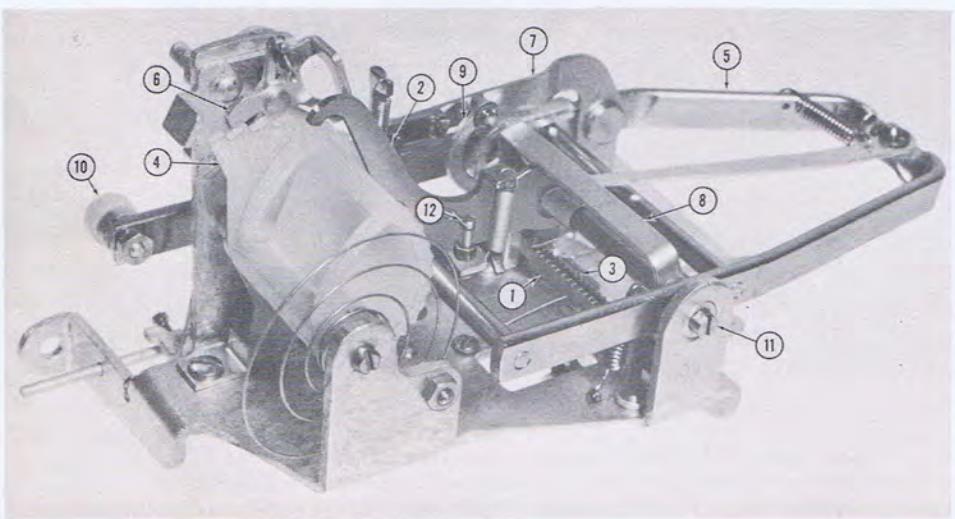


FIGURE 43

1—Feed Ratchet 2—Justifier Cam Follower 3—Check Ratchet 4—Justifier Cam 5—Justifier Cradle 6—Justifier Cam Pawl 7—Cradle Reset Arm 8—Justifier Cam Follower Rack Release 9—Justifier Cam Follower Rack Connecting Link 10—Cradle Roller 11—Cradle Pivot Shaft 12—Cam Follower Adjusting Screw

closer to the cradle pivot point the proportional slide is drawn. A full line (one which does not require justification) positions the center of the proportional slide roller in line with the cam follower shaft on which the cradle pivots.

When the rough typing is completed, and the proportional slide positioned, all the necessary information concerning the number of spaces in the line and the length of the line, or conversely, the amount of space the line is short of being a full or justified line, has been fed into the justifying mechanism.

In the process of tabulating in preparation for retyping the line to justify it, there are four functions which occur in rapid succession. First, the proportional slide must be locked in position. This is accomplished through the action of the tabulator reed. As the reed starts to descend, it causes the lock rod lever (Figure 44-10) to raise the lock rod (Figure 44-9) which releases the friction arm (Figure 44-8) . A tension spring pulls the arm and causes the friction block (Figure 44-11) to bear down (brake action) on the justifier setting shaft arm and locks it and the proportional slide in position.

Second, the justifier operating shaft's position is shifted so that instead of operating the feed ratchet, it will operate the justifier bell crank link (Figure 42-8) which is attached to the justifier bell crank. Attached to this crank is the justifier cam pawl (Figure 43-6) which feeds the cam and distributes the extra space evenly between the words. The operating shaft's position is shifted by the lock rod lever just a fraction of a second after the lock rod is released. The operating shaft is latched in its first position. As the lock rod lever is actuated by the tabulator reed, it draws the latch operating rod (Figure 46-1) to the left. A collar on the rod rotates the cam reset lock (Figure 46-4) which releases the justifier operating shaft. A compression spring on the shaft moves it to the right and positions the bell crank link operating lever, which is pinned to the shaft, under the justifier bell crank link (Figures 47, 48).

Third, the justifier cradle must be unlatched to permit it to drop at which time the justifier cam follower will engage the justifier cam. During rough copy operation the cradle is supported in unoperated position by the engagement of the justifier frame latch and the stud on the side of the cradle. The tail of the frame latch (Figure 46-3) is positioned between two collars on the latch operating rod, and when the rod is drawn to the right by the lock rod lever, the latch is disengaged from the stud permitting the cradle to drop. As the cradle drops, the actuating bar which is supported on the fixed actuating bar roller on the end of the cradle during rough copy operation, is now supported by the proportional slide roller.

Fourth, the carriage must be released and positioned in the justified typing area. This is the last step before retyping the rough line and is accomplished by the tabulator bracket assembly arm which is attached to the flying dog release lever through the release lever connecting link. Simultaneously with the release of the flying dog, the margin release rod draws down both center slides completely releasing the carriage. The carriage moves to the left until the tabulator stop contacts the tabulator reed.

During the justification or second typing, the machine operates normally as each character is printed. Space bar operation, however, actuates the justifier mechanism in addition to its regular func-

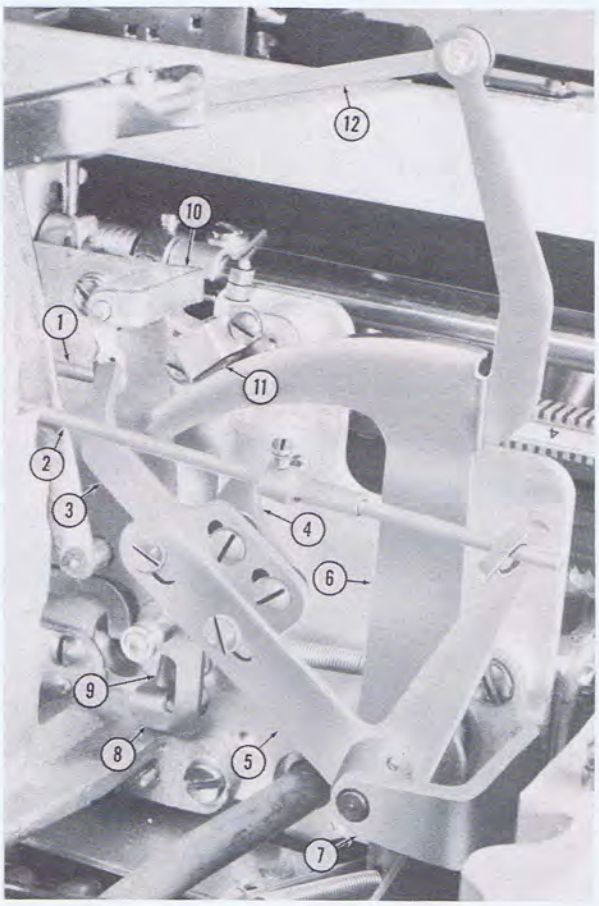


FIGURE 44

1–Latch Operating Rod 2–Cam Reset Rod 3–Cradle Reset Cam 4–Friction Lock Reset Cam 5–Reset Shaft and Lever 6–Justifier Setting Shaft and Arm 7–Rear Reset Bearing 8–Friction Arm 9–Friction Lock Rod 10–Lock Rod Lever 11–Friction Block 12–Proportional Bar Slide

tion. As the space bar is depressed, the same action occurs as in the rough typing except that the justifier actuating shaft is in a different position. The action

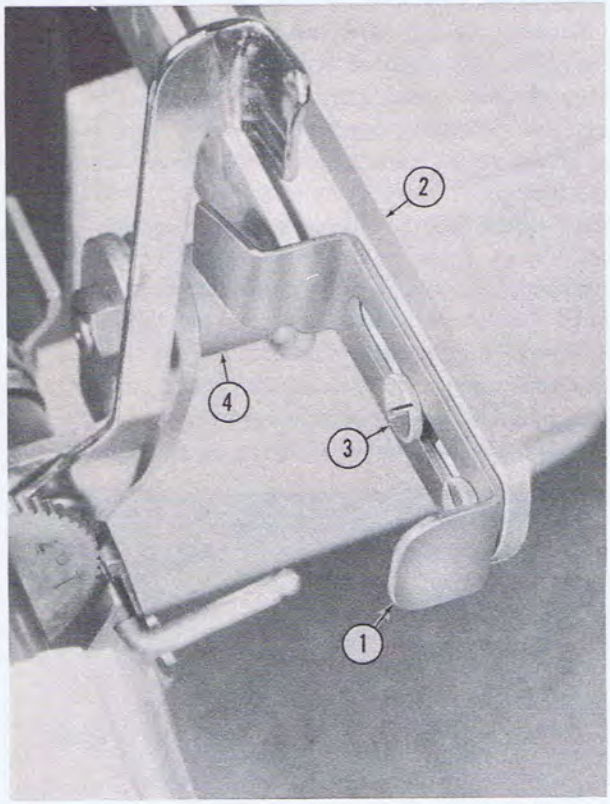


FIGURE 45

1—Actuating Bar Lock 2—Actuating Bar 3—Actuating Bar Lock Mounting Screw 4—Actuating Bar Bell Crank

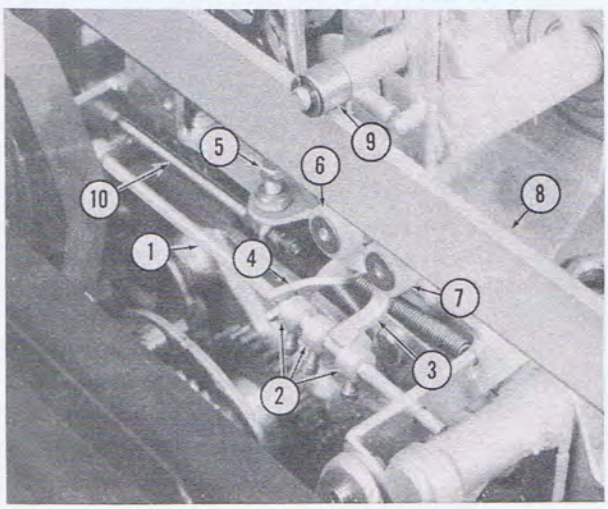


FIGURE 46

1—Latch Operating Rod 2—Retaining Collars 3—Frame Latch 4—Cam Reset Lock 5—Justifier Cradle Adjusting Screw 6—Proportional Bar Slide Roller 7—Justifier Cradle Roller 8—Actuating Bar 9—Actuating Bar Roller 10—Cam Reset Rod

of the shaft operates the bell crank link through the bell crank link operating lever. Operation of the link causes the bell crank to move forward and feeds the cam by means of the cam pawl. As the cam rotates, it allows the cam follower to drop down to the first step. As the cam follower drops, the cradle drops with it and this causes the actuating bar to drop. The action of the actuating bar, actuating bar bell cranks, and carriage escapement rack is the same action which occurs in justification on the unit spacing model except that on the DS machine, the action occurs in steps (between words only) instead of as a continuous movement. The additional space is inserted by the movement of the carriage escapement rack which itself is moving two increments during each space bar operation.

After the line is justified and typing is completed, the carriage is returned to the rough copy starting position. The carriage return function clears the justifier mechanism by returning all parts and assemblies to unoperated position. This is accomplished by the reset lever (Figure 44-5). When the carriage is returned, the left margin stop engages the reset slide and moves it to the right. As the slide moves, it operates the reset shaft and lever.

Mounted on the lever are the cradle reset cam (Figure 44-3) and the friction lock reset cam (Figure 44-4). The friction lock reset cam rotates the friction arm so that the friction block releases the justifier setting shaft. The justifier setting slide tension spring returns the slide to the starting position. The friction arm is moved clear of the friction lock rod and the lock rod compression spring moves the lock rod down to lock the friction arm in unoperated position. The cradle reset cam lifts the cradle reset arm (Figure 43-7) and a spring on the end of the arm lifts the cradle. As the stud on the side of the cradle is raised above the justifier frame latch, the frame latch tension spring pulls the latch under the stud locking the cradle in the raised position. The cam reset rod lever engages a collar on the reset rod moving it to the right. The rod rotates the cam reset lever so that it returns the justifier operating shaft into position to engage the feed ratchet. A second arm on the reset lever enters the notch on the reset lock and the reset lock tension spring pulls the lock into position to hold the lever.

The actuating bar lock (Figure 45) is a friction slide type lock which is mounted on the right end of the actuating bar. The lock's function is to hold the actuating bar in its unoperated position when non-justified copy is being composed.

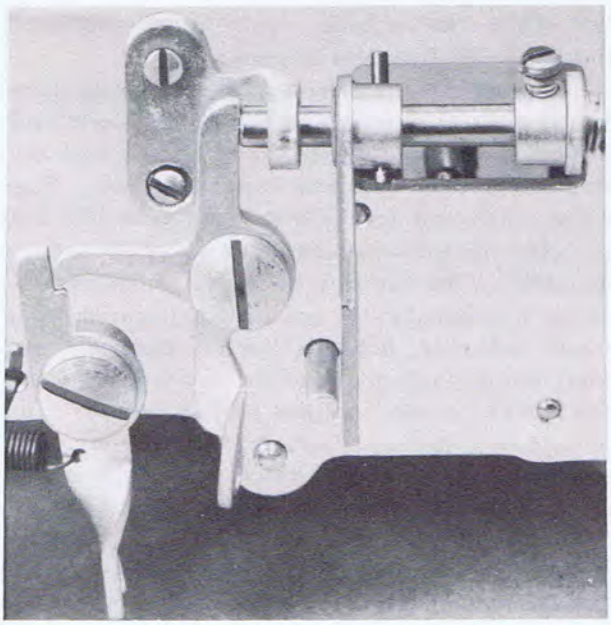


FIGURE 47 JUSTIFIER OPERATING SHAFT (Latched)

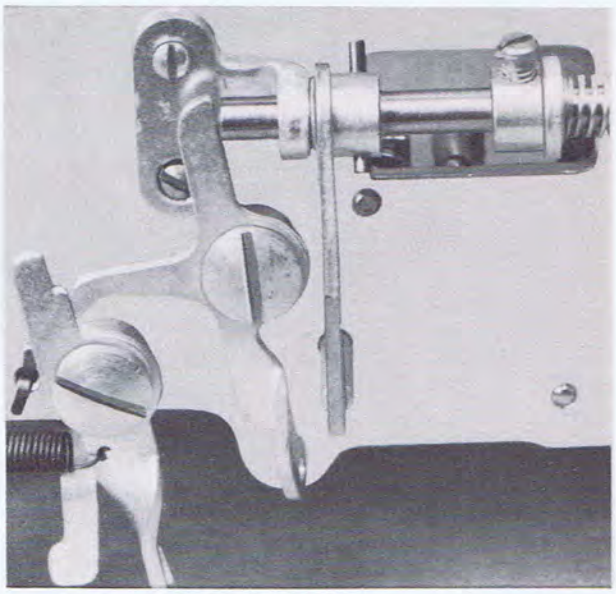


FIGURE 48 JUSTIFIER OPERATING SHAFT (Unlatched)

Non-Print Assembly

The non-print shaft (Figure 49-2), to which the non-print lever is attached, is supported in the non-print lever housing (Figure 49-4) on the front of the machine frame. The bell crank (Figure 49-1) which is fixed to the left end of the shaft is attached to the non-print link (Figure 49-7) which, in turn, is attached to the non-print stop lever (Figure 49-8). When the non-print lever is moved to non-print position, the shaft and bell crank are rotated. This action causes the link to position the stop lever in the path of the stop washer which is attached to the end of the hammer stop rod. In the non-print position, the stop lever engages the stop washer and prevents the hammer from making a full stroke, thereby preventing it from printing.

Mounted on the non-print link is the non-print cutout fulcrum (Figure 49-6) which rotates the cutout lever so that in the non-print position the lever keeps the ribbon feed pawl disengaged from the ribbon feed ratchet and prevents ribbon feed.

VariTyper Composing Machines 519, 565, 330, 660, and 270

VARITYPER 519 (and 565)

The Model 519 is a non-justifying Differential Spacing VariTyper machine with a 16" carriage. The primary purpose for which the machine was designed is forms composition.

A one-increment character spacing has been added to the existing two, three, and four-increment character escapement movements. The addition of the one-increment movement, in conjunction with special one-increment types and coder, results in a higher character count which is an important requisite of good forms composition. The special one-increment types and coders cannot be used in conventional DS machines.

In addition to the one-increment spacing mechanism, two mutually related mechanisms have also been incorporated in the Model 519. They are the wide range impression control unit and the one and two-increment character suppression unit (Figure 50).

The wide range impression control has ten setting positions. These ten settings include one above the maximum and two below the minimum impression settings available on other model VariTyper machines. The lighter impression settings permit the use of small, sharp types at more appropriate impressions.

In conjunction with the use of one-increment types, the one and two-increment character suppressor eliminates the embossing of sharp characters. All characters which fall into the one and two-increment categories are automatically suppressed.

The three attachments; one-increment character spacing, wide range impression control, and one and two-increment character suppressor, comprise the basic difference between the Model 519 and other Differential Spacing VariTyper machines. This does

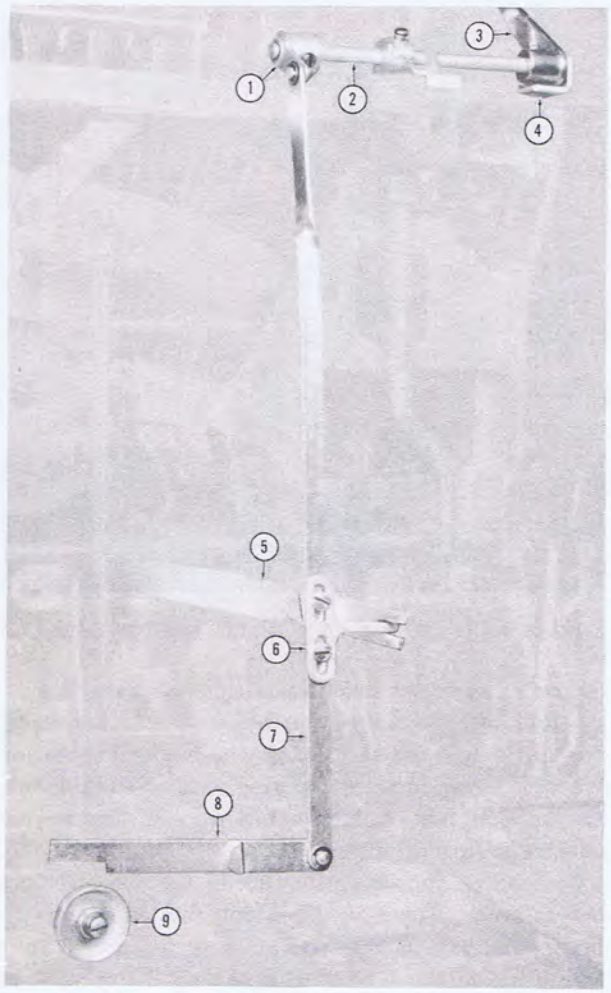


FIGURE 49

1—Non Print Bell Crank 2—Non Print Shaft 3—Non Print Lever 4—Non Print Lever Housing 5—Non Print Cutout Lever 6—Non Print Cutout Fulcrum 7—Non Print Link 8—Non Print Stop Lever 9—Non Print Stop Washer

not, however, restrict the Model 519 to the composition of forms. The machine can be used as a conventional DS machine by replacing the special coder with the appropriate coder for regular DS types and disengaging the one-increment character spacing mechanism through a control lever.

English, special, and foreign language coders can be used in the Model 519. There is, however, one change which must be made to make the coders compatible. The bail support bracket of the conventional coder must be replaced with the bail support bracket which is used on the English one-increment coder. The height of this bracket is .025" less than the bracket used on conventional coders.

When using the modified coder in a conventional DS machine, it will be necessary to raise the increment stops to compensate for the lower rest position of the code bar bails.

One-Increment Character Spacing

One-Increment character spacing is accomplished by the addition of a step on the two-increment stop. During conventional operation, the two-increment stop will give two-increment character spacing. When the one-increment control lever is positioned horizontally, the one and two-increment positioner assembly is raised. The two-increment stop actuating link, which is attached to the one and two-increment positioner assembly, actuates the two-increment stop shaft which, in turn, raises the two-increment stop and places the one-increment step in the path of the flying dog. With the control lever in the one-increment position, all characters which normally take two increments will only take one. When a two-increment character is struck, the two-increment bail is partially raised permitting the two-increment stop to lower so that the flying dog will clear the one-increment step and select two increments. When a three-increment character is typed, the code bar bail is fully raised lowering the two-increment stop to the point where the flying dog will clear it and select three increments. A four-increment code bar lowers the two and three-increment stops allowing the flying dog to bypass them and select four increments.

Code bar, bail, increment stop, and flying dog adjustments are made in the same manner as in conventional DS machines except that the adjustments are more critical because of the shallow bail movement for two-increment selection.

Wide Range Impression Control

The wide range impression control affords a greater

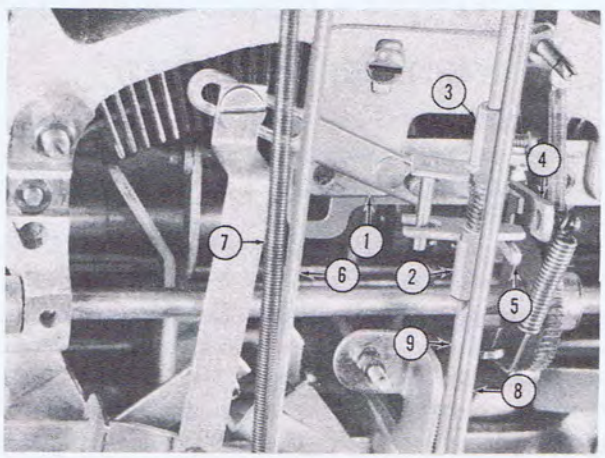


FIGURE 50

1—Suppressor Bracket 2—3-Increment Stop Shaft Latch 3—3-Increment Stop Shaft Actuator Arm 4—Suppressor Spring Bracket 5—Suppressor Shift Actuator Bracket 6—Space Bar Holder Link 7—Space Bar Holder Link Return Spring 8—3-Increment Stop Shaft 9—2-Increment Stop Shaft

ever, the location of the motor and the design of the actuating switch have changed.

The motor is mounted on a bracket at the right rear of the machine. The bracket is mounted on the machine frame using the wayrod support rear mounting screws.

The actuating switch is located in the lower left corner of the keyboard cover. The switch assembly is mounted on the impression control bracket and consists of two snap-action switches and a spring loaded actuator. The first switch (viewed from front of machine) actuates the Forms Attachment motor for continuous operation; the rear switch actuates the Forms Attachment solenoid for single stroke operation. The actuator pivots both left (for continuous operation) and right (for single stroke operation) and is held in unoperated position by means of a tension spring.

Ribbon Feed

The mechanical operation of the ribbon feed mechanism is basically the same as on other VariTyper machines. There are, however, three changes which should be noted: the ribbon feed shaft extension has been eliminated; the ribbon cup is located on the right side of the machine and the ribbon feed bracket (Figure 58-1) is on the left side so that the direction of ribbon feed is from right to left; used ribbon is automatically wound on the ribbon take-up reel.

The ribbon is held in the ribbon cup by means of a retainer which is hinged on the lower edge of the cup and snaps over the upper edge. The ribbon is fed through the ribbon guides and ribbon shield and is pulled by the rotation of the ribbon tension rollers.

The ribbon take-up reel (Figure 58-2) is made in two parts. The outer portion is removable to facilitate removal of the used ribbon from the reel. The reel is mounted on the take-up reel shaft which is driven by a spring belt between a pulley mounted on the shaft and the ribbon take-up motor.

The take-up reel shaft is supported by a bracket mounted on the left side of the machine frame and rotates in bearings in the bracket and frame. The take-up reel pulley is mounted on the shaft against the inside of the bracket. Besides driving the shaft, the pulley also prevents the shaft from being pulled out of the bearing in the frame. The inner portion of the take-up reel slips on the shaft and is held by means of a slip clutch assembly inside its hub. The slip clutch consists of a compression spring between two "D" hole washers and is held on the shaft by two lock nuts. The slip clutch allows the take-up reel to rotate with the shaft to take up used ribbon; when the ribbon is taut, the reel remains stationary and the shaft rotates within it.

The ribbon take-up motor (Figure 58-3) is mounted on a bracket at the left rear of the machine. The motor mounting bracket is attached to the frame using the left wayrod support rear mounting screws. The left wayrod support bracket has two holes in it to allow the spring belt to pass through.

Machine Switch

Because the ribbon take-up motor must run continuously during machine operation, a switch (Figure 59-5) has been added to the machine to turn the power off when the machine is not in opera-

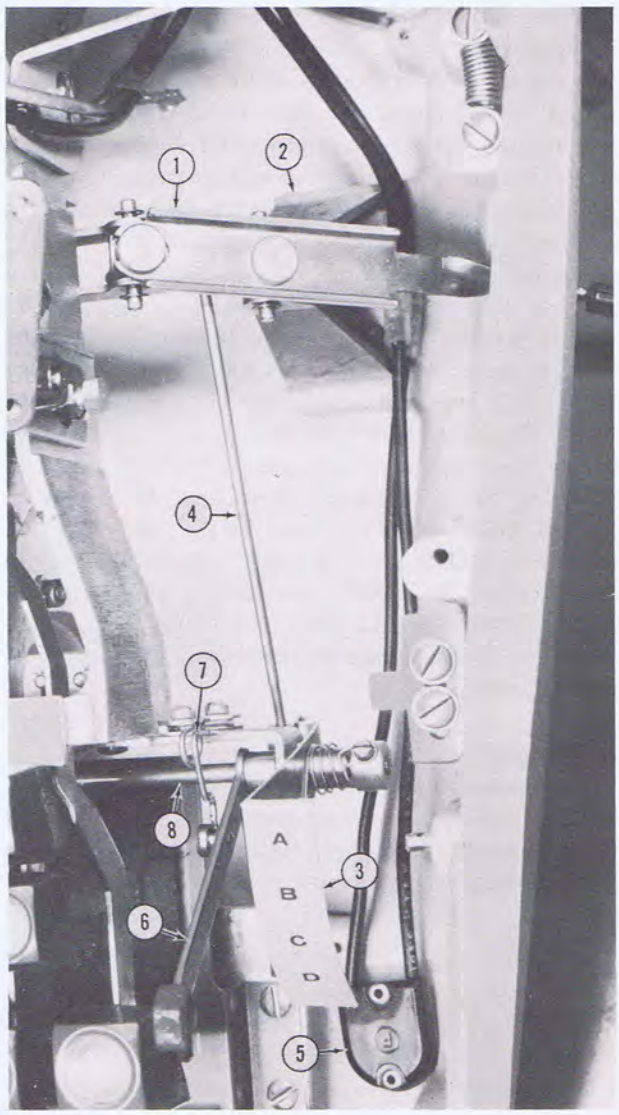


FIGURE 59

1–Spacing Shift Lever Extension 2–Spacing Shift Lever Bracket 3–Spacing Shift Index Dial 4–Spacing Shift Index Link 5–Machine Switch 6–Non Print Lever 7–Non Print Lever Detent Spring 8–Non Print Shaft

tion. The switch is a push type switch and is located on the underside of the machine in the lower right hand corner. Pushing the switch turns the machine on; pushing it in again turns the machine off. In the "Off" position, the machine cannot be operated.

An indicator light located in the top left of the keyboard cover lights when the power is on.

Spacing Shift Assembly

The spacing shift assembly differs from previous models only in the manner of actuation. The spacing shift lever extension is located on the right side of the machine and pivots in the shift lever bracket (Figure 59-2) which is mounted on the inside of the machine case. The shift lever extension engages the spacing shift shaft lever which is mounted on the spacing shift shaft. As the shift lever extension is raised, it depresses the shift shaft lever which in turn rotates the spacing shift shaft. Disengagement of the rack and gear sleeve and positioning of the gear sleeve is accomplished in the same manner as the conventional mechanism.

Mounted on the end of the non-print shaft is the spacing shift index dial (Figure 59-3). The dial is visible through a window in the keyboard cover. The dial is connected to the shift shaft lever by means of the spacing shift index link (Figure 59-4). The index dial is free on the shaft and a compression spring supplies constant pressure which tends to rotate it in a clockwise direction. Movement is limited, however, by lock nuts on the index link. As the spacing shift lever is moved toward the rear of the machine, the compression spring rotates the index dial. When the shift lever is moved in the opposite direction, the lock nuts on the index link engage the dial and rotate it.

Justifier Indicator Dial and Bracket Assembly

The operation of the justifier indicator dial and bracket assembly remains unchanged. The dial and the dial pointer have been redesigned to conform to the styling of the machine.

Margin Indicator Dial (660)

The margin indicator dial is supported in brackets attached to the machine frame and is held by a set screw in the rear bracket. The margin indicator dial is fixed to the shaft housing by a set screw. The dial cup is free to rotate and is held in contact with the margin dial by a compression spring between the cup and an adjustable collar on the shaft housing. The force required to rotate the cup is determined by the compression spring tension.

The pointer is secured to the shaft by means of a set screw. Mounted on the lower end of the shaft by means of a spring clip are two spring washers between two spacers and a pinion gear. The gear engages and rotates with the carriage spring barrel. The spring washers act as a slip clutch permitting the dial pointer to be rotated manually while the gear remains stationary.

Justifier Indicator Dial (660)

The operation of the justifier dial remains unchanged. The design of the dial cup and pointer have been redesigned to conform to the styling of the machine.

The justifier dial light is located in the dial just below the dial shaft. The light is held in a clamp mounted on the dial shaft housing.

Non-Print (660)

The operation of the non-print mechanism is the same as on previous models. The only change is in the configuration of the actuating lever and the use of a detent spring to hold the lever in position.

Standard Shift (660)

The standard shift is actuated by means of the standard shift actuating lever at the top of the keyboard cover. The lever is mounted on a bracket which is secured to the coder housing tie plate. The actuating lever engages the lower end of the standard shift link which rotates on a shoulder screw in the tie plate. The upper end of the link engages the two-increment bail lever pivot stud so that as the actuating lever is moved, the unit slide also moves.

REMOVAL
and
REASSEMBLY PROCEDURES

1. Case

a. Remove the bottom, front, and rear covers.
b. Remove the standard shift arm and plate (DS) (Removal Procedure No. 28).
c. Loosen the horizontal spacing shift lever extension mounting screw and slide the lever out of the case.
d. Hold the ribbon feed gear and unscrew the ribbon feed shaft extension.
e. Remove the hammer spring adjusting bar extension mounting screw and remove the extension.
f. Remove the Forms Attachment base plate mounting screws and pivot the plate and motor assembly out of the cover. Remove the screws which mount the cover to the side of the case and remove the cover. Reassemble the base plate to the cover. Disconnect the wire grommet from the case detent.
g. Loosen the type drawer slide mounting screws and remove the type drawer.
h. Remove the Forms Attachment wire clamp.
i. Move the carriage to the extreme right and remove the carbon paper ribbon cup.
j. Remove the stencil light switch button knurled nut and push the switch inside the case.
k. Remove the stencil light wire clamp.
l. Pull the line cord out of the detent in the case and lock down the cap and fig shift keys and the type change key.
m. Remove the Non-Print lever bracket upper mounting screw (DS).
n. Remove the rear case mounting screws and rubber feet.
o. Remove the front case mounting screws and lift the machine out of the case.
p. Install the rubber feet from the rear of the case on the machine casting using the rear case mounting screw holes.

2. Anvil and Shuttle Arm

a. Move the carriage to the extreme left.
b. Depress and lock the cap shift key.
c. Reach through the rear of the index head and remove the anvil shaft cotter pin. Use a spring hook, cotter pin tool, or pliers to remove the pin.
d. Lift out the anvil.
e. Depress a character key slightly so as to rotate the shuttle arm and remove the shuttle arm.

Reassembly Notes:

(1) When replacing the shuttle arm, make certain the shuttle arm hub lip is properly positioned under the retaining washer.
(2) To replace the cotter pin in the anvil shaft, use a spring hook to raise the anvil shaft spring clear of the cotter pin hole, then insert the cotter pin. Do not permit the cotter pin to be positioned through the bottom loop of the spring as this will prevent the anvil from properly seating itself in the rest or lower position.

3. Anvil (Disassembly)

a. Remove the anvil (Removal Procedure No. 2 a-d).
b. Unscrew the anvil knob.
c. Remove the anvil cover and fiber washers.
d. Remove the flat head screw from the top of the anvil shaft and lift out the anvil yoke sleeve and spring.
e. Lift out the anvil yoke.

4. Anvil Locating Pin

a. Remove the anvil and shuttle arm (Removal Procedure 2).
b. Move the carriage to the extreme right. Remove the locating pin retaining nut and washer and remove the locating pin.

5. Idle Pin and Bracket

a. Lift the anvil and rotate it ¼ turn.
b. Remove the two idle pin mounting screws and the idle pin.
c. Loosen the center index head top plate mounting screw and slide the bracket from under the top plate.

Reassembly Note:

Be sure that the idle pin position will permit free movement of the anvil when a type is on the idle side of the anvil.

6. Parallel Shield Mechanism

a. Remove the anvil and shuttle arm (Removal Procedure 2).
b. Remove the shield lift lever spring clip and disconnect the shield connecting link and shield lift lever from the journal shaft actuating arm.
c. Remove the regulator knob and right shield frame clearance adjusting screw.
d. Remove the left lock nut and slip the shield frame off the left clearance adjusting screw.
e. Remove the four screws which secure the journal shaft to the index head and lift out the journal shaft. Separate the clearance adjusting screw from the journal shaft arm.
f. Remove the shield lift lever bracket mounting screw located in the front of the index head and remove the lever and bracket.

7. Keylevers

a. Remove the keylever retainer bar.
b. Lift out the character keylevers. Before removing the suppressed keylevers (comma, period, hyphen), the brass links must be straightened so that they can be removed from the suppressor.
c. Remove the justifier rack guide and dial bracket assembly.
d. Remove the standard shift arm (DS).
e. Loosen the collar near the right end of the anvil lift lever shaft and remove the right fig shift keylever.
f. Remove the right cap shift keylever.
g. Remove the back space keylever.
h. Remove the margin dial assembly (DS).
i. Loosen the collar near the left end of the anvil lift lever shaft and remove the left cap shift keylever.
j. Remove the stud from the repeat pivot bracket to obtain clearance and remove the left fig shift keylever.
k. Unhook the type change key spring and remove the type change keylever.
l. Straighten the repeat lever link and remove the repeat keylever and link. Separate the keylever and the link.

Reassembly Note:

Exercise care when reassembling cap and fig shift keylevers and keylever retainer bar to avoid damaging the shift keylever compression springs.

8. Space Bar Bracket and Keylever

a. Remove the two space bar mounting screws and remove the space bar from the bracket.
b. Unhook the space bar holder link spring (DS).
c. Remove the two holder link mounting screws (DS).
d. Remove the two space bar bracket mounting screws and the bracket.
e. Remove the keylever retaining bar and remove the space bar keylever.

9. Keylever Fulcrum

a. Remove the keylevers (except the suppressed character keys) (Removal Procedure No. 7 a-c).
b. Remove the space bar keylever (Removal Procedure No. 8).
c. Remove the keylever fulcrum mounting screws from the bottom of the machine frame and lift out the fulcrum.

10. One-Increment Keylever

a. Remove the case (Removal Procedure No. 1).
b. Disengage the yielding spring from the one-increment space link.
c. Remove the spring clip and disengage the space link from the keylever.
d. Loosen the set screw in the hub of the keylever.
e. Remove the spring clip from the end of the keylever shaft and remove the shaft.
f. Remove the keylever.

11. Repeat Trip Lever

a. Unhook the repeat trip lever return spring.
b. Remove the trip lever stud retaining nut and remove the stud from the trip lever and trip arm.
c. Remove the trip lever.

12. Repeat Lever Shaft and Trip Arm

a. Straighten the repeat key link.
b. Loosen the set screws in the retaining collar and the trip arm hub.
c. Pull the pin in the trip arm hub and remove the repeat lever shaft.
d. Remove the trip lever from the trip arm.
e. Remove the spring clip from the trip arm stud and disengage the trip arm from the repeat latch link (DS).

13. Repeat Latch

a. Remove the hammer eccentric screw lock nut.
b. Remove the repeat latch.

14. Repeat Latch (DS)

a. Remove the motor and bracket from the carriage escapement mounting bracket. It is not necessary to disconnect the motor lead wires.
b. Remove the spring clip holding the repeat latch link to the repeat shaft lever, and disconnect the link.

c. Remove the two latch mounting screws from the escapement mounting bracket and remove the assembly.

15. Tabulator Keylever

a. Remove the motor box (Removal Procedure No. 109).
b. Loosen the set screws on the back space rod front lever and back space rod rear arm.
c. Remove the back space rod bushing from the end of the back space rod (made accessible by removal of the motor box).
d. Work the back space rod out of the machine completely or far enough to the rear of the machine to allow removal of the tabulator keylever shaft.
e. Remove the tabulator keylever shaft from the casting.
f. Remove the keylever retainer bar and lift out the tabulator keylever.

16. Tabulator Bracket

a. Move the carriage to the extreme left.
b. Remove the pin from the push rod head.
c. Remove the spring clip and disengage the flying dog release lever link (DS).
d. Remove the tabulator reed spring and shoulder screw.
e. Remove the margin release rod lock nuts.
f. Loosen the set screw in the tabulator pivot shaft collar releasing the spring tension.
g. Remove the three tabulator bracket mounting screws and work the bracket out of the machine.

17. Back Space Rod

a. See Tabulator Keylever (Removal Procedure No. 15, a-d).

18. Back Space Lever and Pawl

a. Remove the tabulator bracket. (Removal Procedure No. 16).
b. Remove the Forms Attachment suppressor block (Removal Procedure No. 123).
c. Remove the back space lever and pawl assembly mounting screw and maneuver the assembly out of the machine.

19. Non-Print Lever Housing

a. Loosen the retaining collar and non-print bell crank set screws.
b. Remove the two lever housing mounting screws (lower mounting screw is also the case mounting screw).
c. Slide the non-print lever and shaft to the left and lift out the lever housing.

20. Non-Print Shaft

a. Loosen the retaining collar, non-print bell crank, and non-print lever set screws.
b. Remove the non-print bell crank with the non-print link attached from the shaft.
c. Work the shaft out toward the left, removing the lever and the collar as they are released.

21. Non-Print Link

a. Remove the spring clip which holds the non-print link to the non-print bell crank and disconnect the link.
b. Remove the spring clip which holds the non-print link to the stop lever and remove the link.
c. Remove the non-print cutout fulcrum which is attached to the link.

22. Non-Print Stop Lever

a. Remove the spring clip which holds the non-print link to the stop lever and disconnect the link.
b. Remove the stop lever mounting screw and remove the lever.

23. Non-Print Stop Washer

a. Remove the hammer stop nut lock screw.
b. Remove the top lock nut and lift off the washer.

24. Non-Print Cutout Lever and Fulcrum

a. Remove the cutout fulcrum mounting screws and remove the fulcrum.
b. Remove the cutout lever mounting screw and remove the lever.

25. Bails

a. Pull the standard shift arm to standard position.
b. Remove the spring clips securing the bail throwout links to the bails and disconnect the links.
c. Remove the bails carefully to prevent bending them.

26. Bail Throwout Lever

a. Unhook the bail throwout lever tension spring.
b. Remove the two spring clips and remove the lever.

27. Bail Levers

a. Remove the spring clips holding the two and three-increment bail links to the bail levers and disconnect the links.
b. Remove the spring clip from the lever stud and remove the levers.

28. Standard Shift Arm and Plate

a. Remove the spring clip securing the standard

shift arm to the unit slide. Disengage the arm from the slide.

b. Remove the shift arm plate mounting screw and remove the shift arm and plate.

c. Unscrew the knob from the end of the shift arm and slide off the plate.

29. Unit Slide

a. Remove the standard shift cam.

b. Remove the spring clip securing the standard shift arm to the unit slide. Disengage the arm from the slide.

c. Remove the spring clips holding the two and three-increment bail links to the bail levers and disconnect the links.

d. Remove the two shoulder screws and lock nuts which mount the unit slide on the tie plate and lift off the slide.

30. Tie Plate

a. Remove the unit slide. (Removal Procedure No. 29)

b. Remove the four mounting screws and nuts which secure the tie plate to the coder brackets and remove the tie plate.

31. Coder Bracket and Tie Plate Assembly

a. Remove the coder.

b. Remove the two spring clips holding the two and three-increment bail links to the bail levers and disconnect the links.

c. Remove the spring clip securing the standard shift arm to the unit slide. Disengage the arm from the slide.

d. Remove the two bail throwout lever springs.

e. Remove the brace mounting screw (bottom) and the four bracket mounting screws. Work the assembly out of the machine.

32. Anvil Lift Lever and Shaft

a. Remove the keylevers (except the suppressed character keys) (Removal Procedure No. 7).

b. Remove the space bar bracket and the space bar keylever (Removal Procedure No. 8).

c. Remove the coder bracket and tie plate assembly (DS) (Removal Procedure No. 31).

d. Loosen the set screw in the rear bracket and remove the justifier dial assembly (DS).

e. Remove both the justifier and margin dial assembly front brackets (DS).

f. Remove the repeat pivot bracket.

g. Loosen both lift lever shaft pivot lock screws or nuts.

h. Back out both pivot screws until the shaft is released. Then work the shaft and lever out of the machine.

33. Justifier Indicator Dial and Bracket Assembly

a. Loosen the mounting screw and remove the justifier rack guide.

b. Remove the keylever retainer bar.

c. Remove the three bracket mounting screws and work the assembly out of the machine.

34. Justifier Indicator Dial (DS)

a. Disconnect the justifier indicator dial light lead wires (Model 660).

b. Loosen the set screw in the rear bracket and remove the dial assembly.

c. Remove the dial knob and the washer.

d. Loosen the set screw in the pointer hub and remove the pointer.

e. Slide out the gear and shaft assembly.

f. Loosen the set screw in the dial hub and remove the dial

Reassembly Note:

Be sure the set screw in the rear bracket is positioned in the shaft housing locating dimple and that the pointer is zeroed.

35. Margin Indicator Dial (DS)

a. Loosen the set screw in the rear bracket and remove the dial assembly.

b. Remove the dial knob, washer, pointer, spring washer, and bottom washer.

c. Remove the gear shaft pin and remove the gear and shaft.

d. Loosen the set screw in the back plate hub and remove the back plate assembly.

e. Remove the three plastic scale mounting screws and remove the scale and bezel. Separate the scale from the bezel.

f. Remove the friction washer.

Reassembly Note:

Be sure that the set screw in the rear bracket is positioned in the shaft housing locating dimple and that the dial is centered.

36. Carbon Ribbon Feed Bracket Assembly

a. Remove the machine from the case. (Removal Procedure No. 1)

b. Loosen the bracket shaft gear set screw and remove the gear, spring, and washer.

c. Remove the two carbon ribbon feed bracket mounting screws and remove the bracket assembly.

37. Carbon Ribbon Feed Bracket Shaft

a. Remove the ribbon feed shaft extension.

b. Loosen the set screw in the bracket shaft gear and remove the gear, spring and washer.

c. Loosen the upper collar set screw.
d. Lift the shaft and loosen the lower collar set screw and remove the shaft.

38. Carbon Ribbon Feed Tension Roller

a. Unhook the tension roller spring (located underneath the bracket).
b. Remove the tension arm spring clip and lift out the arm, tension roller, and the tension arm spring.

39. Carbon Ribbon Cup Plate

a. Remove the machine from the case (Removal Procedure No. 1).
b. Remove the two cup plate mounting screws and remove the plate.

40. Ribbon Feed Shaft (Horizontal)

a. Loosen the set screws in all gears and collars on the horizontal ribbon feed shaft.
b. Slide the shaft out of the machine frame toward the right side of the machine removing gears, collars, and the steel detent ball and compression spring (located in the left bearing) as they are released.
c. Unscrew the ribbon feed shaft extension.

41. Fabric Ribbon Feed Shaft (Vertical)

a. Remove the vertical shaft thumb nut.
b. Remove the two ribbon cup mounting screws.
c. Remove the ribbon spool drive collar and the ribbon cup.
d. Loosen the lower collar, disengage the bottom of the vertical shaft from the universal, and work the shaft out of the machine.

42. Fabric Ribbon Feed Bottom Shaft and Universal

a. Loosen the vertical shaft lower collar and disengage the shaft from the universal.
b. Loosen the set screw in the bottom shaft gear.
c. Remove the bottom shaft and universal, slipping the gear and spring from the shaft in the process.

43. Fabric Ribbon Feed Reverse Arm and Trip Lever

a. Loosen the trip lever set screw and remove the trip lever.
b. Remove the ribbon cup mounting screws.
c. Remove the ribbon spool drive collar and the ribbon cup.
d. Lift out the reverse arm.

44. Index Head (Old Style)

a. Remove the anvil and shuttle arm (Removal Procedure No. 2).
b. Remove the shield lift lever spring clip and disengage the shield connecting link from the lift lever.
c. Remove the fabric ribbon feed vertical shaft (Removal Procedure No. 41).
d. Remove the fabric ribbon feed bottom shaft and universal. (Removal Procedure No. 42).
e. Remove the reverse arms and trip levers (Removal Procedure No. 43).
f. Remove the fabric ribbon cup brackets side and bottom mounting screws and remove the brackets and the Forms Attachment cut-off switch bracket.
g. Disconnect the driver lever springs.
h. Loosen the driver lever shaft lock screws and back out the driver lever shafts far enough to disengage the space hook and the index head bracket.
i. Remove the front, bottom index head mounting screw and spacer.
j. Lift the index head out of the machine.

Reassembly Notes:

(1) When replacing the front index head mounting screw, position the spacer so that the flat is parallel to the side of the space bar keylever.
(2) Make sure the space hook is properly positioned when reassembling the driver lever shafts and driver levers.

45. Index Head and Casting (New Style)

a. Remove the anvil and shuttle arm (Removal Procedure No. 2).
b. Disconnect the driver lever return springs from the driver levers.
c. Remove the shield lift lever spring clip and disengage the shield connecting link from the lift lever.
d. Remove the bell striker assembly (DS).
e. Remove the Forms Attachment cut-off switch bracket.
f. Disconnect the center slide links from the setting shaft and reset shaft levers (DS).
g. Disconnect the center slide connecting link from the sine shift shaft.
h. Disconnect the center slide return spring.
i. Loosen the mounting screw and remove the justifier rack guide.
j. Remove the margin release rod adjusting and lock nuts.
k. Remove the horizontal ribbon shaft (Removal Procedure No. 40).
l. Remove the index head and casting mounting screws.
m. Lift index head and casting assembly out of the machine. *(Note:* Check for shims between index head casting and machine frame.)

46. Index Pins

a. Lift the pin out of the bottom index head plate.

b. Work the pin down, clearing the bottom plate, and out of the top index head plate. *(Note:* In the removal position, the index pins are tight in the top plate and must be forced out. If pliers or other tools are used to aid removal, exercise care to avoid scratching or burring the pin.)

47. Driver Arm

a. Remove the anvil and shuttle arm (Removal Procedure No. 2).

b. Remove the upper, inside driver lever brace lock nut.

c. Remove the two driver arm mounting screws and remove the driver arm.

48. Driver Levers and Shafts

a. Remove the index head (Removal Procedure No. 44 or 45).

b. Loosen the lock screws or lock nuts and back the driver lever shafts completely out of the machine casting.

c. Lift out the driver levers and arms.

49. Driver Lever Brace

a. Remove the anvil and shuttle arm (Removal Procedure No. 2).

b. Remove the coder (DS).

c. Unhook the driver lever spring from the driver lever.

d. Remove the driver lever brace bottom, outer lock nut.

e. Remove the driver arm mounting screws. Then work driver arm and driver lever brace out of the machine.

f. Separate the driver arm and driver lever brace.

50. Paper Guide and Retainer

a. Back up the thumb screw to remove the spring tension.

b. Remove the two guide mounting screws. Remove the guide and retainer.

51. Paper Bail and Support

a. Remove the paper bail or the plotting scale holder.

b. Remove the support lock nuts and mounting screws and remove the support.

52. Paper Table

a. Loosen the two end mounting screws.

b. Remove the four paper table support bracket mounting screws (Model 350).

c. Remove the two front mounting screws.

53. Margin Rack and Adjusting Stud Bracket

a. Remove the center and the right margin rack shoulder screws.

b. Remove the two adjusting stud bracket mounting screws.

c. Slide the rack away from the left shoulder screw. Remove the rack and the bracket.

54. Carriage Release Lever (Right)

a. Loosen the set screw in the VariLine Attachment detent holder and remove the holder.

b. Remove the release lever mounting screw, washer, spring, and spacer.

c. Remove the extension arm and brace mounting screw and pivot the brace out of the way (Model 350).

d. Disengage the bottom tip of the lever from the carriage release rod stud and remove the lever.

55. Carriage Release Lever (Left)

a. Remove the release lever mounting screw, washer, spring, and spacer.

b. Disengage the bottom tip of the lever from the carriage release rod stud and remove the lever.

56. Carriage Bell Crank Bracket (Right)

a. Remove the right justifier bell crank (Removal Procedure No. 133).

b. Remove the right carriage release lever (Removal Procedure No. 54).

c. Remove the three carriage bell crank bracket mounting screws and slide the bracket off the hanger shaft. *(Note:* Check for shims between the bracket and the carriage end.)

57. Carriage Bell Crank Bracket (Left)

a. Remove the left justifier bell crank (Removal Procedure No. 133).

b. Remove the left carriage release lever (Removal Procedure No. 55).

c. Remove the Linomatic housing (Removal Procedure No. 71).

d. With Auto-Wind Roller Attachment, remove the left support bracket mounting screw, loosen the retaining collar, and remove the support bracket.

e. Slide the Auto-Wind release lever off the release lever hub.

f. Slide the Auto-Wind retaining collar and hub off the hanger shaft.

g. Remove the three carriage bell crank bracket mounting screws and slide the bracket off the hanger shaft. *(Note:* Check for shims between the bracket and the carriage end.)

58. Carriage Release Rod

a. Disengage the carriage release lever tips from the release rod studs.
b. Remove the escapement rack mounting screws.
c. Remove the taper pins from the escapement rack ends.
d. Slide the escapement rack guide rod out of the machine and remove the release rod.

59. Carriage Escapement Rack

a. Unhook the counter-balance spring from the escapement rack (DS).
b. Remove the carriage release rod (Removal Procedure No. 58).
c. Remove the escapement rack.

60. Carriage Steady Bracket

a. Remove the taper pins from the carriage escapement rack ends and slide the guide rod beyond the steady bracket.
b. Loosen the lock nuts on the steady bracket mounting screws and remove the mounting screws. Remove the steady bracket. *(Note:* Exercise care so as to prevent cracking the paper basket.)

Reassembly Note:

Be sure that the lock nuts are replaced and that screws and nuts are tight.

61. Carriage Bearing

a. Remove the taper pins from the carriage escapement rack ends and slide the guide rod beyond the bearing.
b. Loosen the lock nut. Then remove the mounting screw and bearing.

62. Carriage Front Guide

a. Remove the anvil and shuttle arm (Removal Procedure No. 2).
b. Remove the two front guide mounting screws and lift the guide out of the machine.
c. Remove the lock nut and unscrew the eccentric stud and roller.

63. Auto-Wind Roller Attachment

a. Remove the collar at the extreme right end of the roller.
b. Remove the right roller support bracket.
c. Remove the gear and roller from the machine.
d. Loosen the left roller support bracket retaining collar.
e. Remove the support bracket mounting screw and remove the bracket.
f. Slide the release lever off the release lever hub.
g. Remove the detent spring.
h. Remove the Linomatic housing (Removal Procedure No. 71).
i. Slide the retaining collar and release lever hub off the hanger shaft.

64. Carriage Assembly

a. Move the carriage to the right, hold the carriage band securely and remove the band mounting screw from the bottom of the right carriage end. *(Note:* Avoid crimping or putting a sharp bend in the carriage band as it may crack.)
b. Hook the carriage band to the wayrod support bracket (A paper clip formed so that one end can be hooked to the carriage band and the other end to the support will hold the band securely.).
c. Remove the paper table (Removal Procedure No. 52).
d. Remove the feed roll opener (Removal Procedure No. 72).
e. Remove the right carriage bell crank bracket Removal Procedure No. 56).
f. Remove the carriage limit stop from the right end of the tabulator rack.
g. Loosen the large feed roll setter adjusting screw lock nut and remove the screw.
h. Remove the anvil and the carriage front guide. (Removal Procedures No. 2 a-d and 62).
i. Remove the tie rod and small feed roll assembly (Removal Procedure No. 77a, b).
j. Slide the carriage out of the left side of the machine.

65. Carriage Paper Basket

a. Loosen the paper basket clamps mounted to the hanger shaft and disengage them from the paper basket.
b. Remove the carriage tie rod and small feed rolls (Removal Procedure No. 77).
c. Slide the paper basket out of the machine.

Reassembly Notes:

(1) For ease of insertion, pre-curl a new paper basket by storing in a cylindrical container.
(2) Be sure the plastic edge of the paper basket is secured by the basket support.

66. Linomatic Index Gear and Dial

a. Remove the three cover mounting screws and remove the cover assembly. Do not loosen the screw bushing lock nut.
b. Remove the three indexing gear and dial

mounting screws and remove the gear and dial.

Reassembly Note:

Be sure the two locating pins are in the cover locating holes before tightening the mounting screws.

67. Linomatic Index Swivel and Handle

a. Remove the cover assembly (Removal Procedure No. 66a).
b. Lift the index swivel and handle off the shaft.
c. Unhook the index handle spring.
d. Remove the shim plate from the bottom of the swivel. Then separate the handle and swivel.

68. Linomatic Feed Lever, Pawl, and Shift Arm

a. Remove the cover assembly (Removal Procedure No. 66a).
b. Lift the index swivel and handle from the shaft.
c. Unhook the feed lever return spring and lift the lever off the shaft.
d. Remove the pawl spring clips and lift the pawls off their shafts.
e. Disconnect the pawl tension spring.
f. Remove the spring clip and washer holding the shift arm and lift it off its stud.

69. Linomatic Gears and Shaft

a. Remove the Linomatic feed lever (Removal Procedure No. 68 a-c).
b. Back out the feed lever return spring mounting screw flush with the side of the housing.
c. Loosen the detent spring mounting screw.
d. Lift out the gears and shaft.

Reassembly Note:

Check shim washer at bottom of housing.

70. Linomatic Clutch Assembly

a. Use wrench 09-0129-0 to remove the lock nut in the left feed roll knob.
b. Slide the washer, knob, and compression spring off the clutch bushing.
c. Screw the two part bushing off the feed roll shaft.

71. Linomatic Housing

a. Remove the clutch assembly (Removal Procedure No. 70).
b. Remove the gears and shaft (Removal Procedure No. 69).
c. Remove the pin from the feed roll shaft collar.
d. Remove the mounting bracket screws.
e. Slide the housing, bushing, washer, gear, and collar off the feed roll shaft.

Reassembly Note:

The grooved ends of the washer and collar go toward the rear.

72. Feed Roll Opener

a. Loosen the set screws in the VariLine Attachment bushing and remove the entire assembly including the right feed roll knob.
b. For machines with Auto-Wind roller attachment, remove the right feed roll knob. Remove the gear mounted to the feed roll shaft.
c. Remove the feed roll shaft sprocket and extension arm bracket (Model 350) (Removal Procedure No. 82).
d. Remove the feed roll opener shoulder screw and roller.
e. Slide the feed roll opener off the feed roll shaft.

73. Carriage End (Right)

a. Remove the paper table (Removal Procedure No. 52).
b. Remove the Auto-Wind Roller Attachment (Removal Procedure No. 63, a-c)
c. Let down the large feed roll tension. (Removal Procedure No. 76, b-d)
d. Remove the VariLine Attachment bushing, gear, and knob from the feed roll shaft.
e. Remove the VariLine detent spring holder from the feed roll hanger shaft screw.
f. Remove the feed roll opener (Removal Procedure No. 72).
g. Remove the right carriage release lever (Removal Procedure No. 54).
h. Remove the right carriage bell crank bracket (Removal Procedure No. 56).
i. Remove both taper pins from the carriage escapement rack ends.
j. Move the carriage to the extreme right and disconnect the carriage band from the carriage end (Removal Procedure No. 64 a).
k. Remove the right tie rod mounting screw, right tabulator rack mounting screws (one tabulator rack mounting screw also secures the carriage limit stop), and right carriage carrier mounting screw.
l. Remove the right carriage escapement rack mounting screw.
m. Push the escapement rack guide rod toward the left only far enough to disengage the right carriage end.
n. Remove the carriage end.

Reassembly Note:

Remove the margin rack shoulder screw and

side paper table mounting screw from the old carriage end.

74. Carriage End (Left)

a. Remove the paper table (Removal Procedure No. 52).
b. Remove the Auto-Wind Roller left support (Removal Procedure No. 63 d-e).
c. Let down the large feed roll tension (Removal Procedure No. 76, b-d).
d. Remove the left carriage release lever (Removal Procedure No. 55).
e. Remove the margin rack and adjusting stud bracket (Removal Procedure No. 53).
f Remove the Linomatic housing (Removal Procedure No. 71).
g. Remove the line feed lever.
h. Remove the left carriage bell crank bracket (Removal Procedure No. 57).
i. Remove both taper pins from the carriage escapement rack ends.
j. Move the carriage to the extreme left and remove the left tie rod mounting screw, the left tabulator rack mounting screws, and the left carriage carrier mounting screw.
k. Remove the left carriage escapement rack mounting screw.
l. Push the carriage escapement rack guide rod toward the right only far enough to disengage the left carriage end.
m. Remove the carriage end.

Reassembly Note:

Remove the margin rack shoulder screw, side paper table mounting screw, and the line feed lever return spring from the old carriage end.

75. Carriage Center Support

a. Unhook the escapement rack counter balance spring (DS).
b. Unhook the rack tension roller spring and remove the spring bracket. It may be necessary to flex the tabulator rack to get clearance for the bracket mounting screw.
c. Remove the margin rack (Removal Procedure No. 53).
d. Remove the small feed rolls and tie rod (Removal Procedure No. 77).
e. Remove the carriage carrier mounting screw. *Note:* Avoid damaging the paper basket.
f. Work the center support out of the machine.

76. Large Feed Roll

a. Remove the paper table (Removal Procedure No. 52).
b. Remove the carriage limit stop from the right end of the tabulator rack.
c. Remove the justifier actuating bar and right bell crank (Removal Procedures No. 132 and 133).
d. Let down the large feed roll tension as follows: Remove the most accessible tension spring collar set screw from one of the collars and install an anvil locating pin, ribbon feed shaft extension, or any long screw with a 5/40 thread. Loosen the other collar set screw slowly and allow the spring to unwind. Remove the set screw and replace it with another anvil locating pin (see above). Hold the second pin and remove the first and allow the spring to unwind further. Continue to do this until all the spring tension is relieved. Repeat the process on the remaining three tension spring collars.
e. Loosen the set screws in the VariLine Attachment bushing and remove the entire assembly.
f. Remove the feed roll shaft sprocket (Model 350) (Removal Procedure No. 82).
g. Remove the feed roll opener shoulder screw and remove the feed roll opener.
h. Loosen lock nut and back up the feed roll setter screw to clear hole in right feed roll hanger.
i. Remove the feed roll setter mounting screws and slide the setter off the shaft.
j. Loosen the set screws in the feed roll center support bracket. Swing the bracket back and remove the support roller.
k. Remove the feed roll ratchet spring.
l. Remove the Linomatic housing (Removal Procedure No. 71).
m. Remove the line feed operating lever pivot screw. Then remove the lever, tension spring, and swivel.
n. Remove the line space bracket (Model 350).
o. Remove the two screws which mount the left feed roll hanger top to the feed roll hanger bottom.
p. Slide the feed roll out of the right feed roll hanger and remove it from the carriage.

77. Small Feed Rolls

a. Remove the three tie rod mounting screws.
b. Move the carriage to the extreme left and work the tie rod and small feed roll assembly from the carriage.
c. Remove the front paper basket support from the tie rod.

d. Back out the feed roll bearing adjusting screws until the screw heads are flush with the surface of the tie rod.
e. Loosen the set screws in the feed roll collars.
f. Loosen the feed roll bearing mounting screws and remove the bearings and feed rolls.

Reassembly Notes:

(1) Be sure the feed rolls are free in their bearings with about 1/64" end play.

(2) Replace the tie rod and small feed rolls in the machine so that the tie rod is engaged by the front guide. Engage the left end of the paper basket into the left end of the paper basket support. Hold the tie rod against the left carriage end and move the carriage to the extreme right. Lift the right end of the tie rod slightly so that the paper basket will engage the support along its entire length. Re-install the mounting screws.

78. *Variable Line Spacer Assembly*

a. Remove the large feed roll (Removal Procedure No. 76).
b. Unscrew the variable spacer push rod lock nut and remove the push rod.
c. Unscrew the left feed roll knob.
d. Remove the pawl carrier assembly.
e. Pull the variable spacer assembly out of the feed roll until the pawl pins are exposed. Drive the pins out, disengage the pawls from the disc and flange, and remove the assembly and the pawls.

Reassembly Note:

When re-installing the variable spacer pawls in the feed roll, care must be exercised to prevent the pawls from falling into the core of the feed roll.

79. *Feed Roll Ratchet*

a. Remove the large feed roll. (Removal Procedure No. 76).
b. Remove the variable spacer push rod and feed roll knob.
c. Remove the pawl carrier assembly.
d. Hold the variable spacer nut with wrench 09-0130-0 and unscrew the ratchet with wrench 09-0136-0. *(Note:* Be sure to hold the ratchet wrench (09-0136-0) flat against the ratchet to avoid shearing the pins.)

80. *Feed Roll Hanger Shaft*

a. Remove the large feed roll (Removal Procedure No. 76).
b. Remove the paper basket clamps.
c. Remove the escapement rack tension roller spring.
d. Remove the left carriage end (Removal Procedure No. 74).
e. Remove the hanger shaft assembly. If a new part is needed the entire assembly is replaced.

81. *Feed Roll Extension Arm (350)*

a. Remove the chain.
b. Remove the extension arm and brace mounting screw.
c. Remove the two extension arm and bracket mounting screws.
d. Remove the extension arm.

82. *Feed Roll Shaft Sprocket and Extension Arm Bracket (350)*

a. Remove the right feed roll knob lock nut and remove the knob.
b. Loosen the set screws and remove the knob extension.
c. Remove the chain.
d. Remove the two extension arm and bracket mounting screws.
e. Loosen the shaft sprocket set screws and slide the sprocket and bracket off the feed roll shaft.

83. *Center Slide*

a. Remove the Carriage (Removal Procedure No. 64). *(Note:* On some non-justifying models the center slide can be removed from the machine without removing the carriage. It is necessary, however, to have appropiate offset screw drivers available for the removal of the center slide mounting screws. These screws are partially accessible while the carriage is on the machine. If offset screw drivers are not available, it is recommended that the carriage be removed to avoid damaging the screws.)
b. Remove the margin release rod adjusting and lock nuts.
c. Remove the spring clip which secures the center slide to the sine shift shaft actuating lever link and disconnect the two parts.
d. Remove the two center slide mounting screws and lift the slide out of the machine.

84. *Center Slide (DS)*

a. Follow Removal Procedure No. 83, Center Slide.
b. In addition, remove the shoulder screws and disconnect the center slide links from the justifier setting shaft and reset shaft.

85. Wayrod

a. Remove the carriage (Removal Procedure No. 64).
b. Drive out both dowel pins at the extreme ends of the wayrod. *(Note:* It is advisable to mark the wayrod shims so that they will be reassembled on the same side as before.)
c. Remove the four bracket mounting screws. Remove the wayrod and the brackets.
d. Drive out the bracket dowel pins and remove the brackets.

86. Wayrod Supports

a. Remove the machine from the case (Removal Procedure No. 1).
b. Drive out the dowel pin at the end of the wayrod.
c. Remove the support mounting screws and the supports. *(Note:* When removing both wayrod supports it is advisable to remove the carriage. (Removal Procedure No. 64, except anchor carriage band to other convenient part of machine.)

87. Carriage Spring Barrel (Removal and Disassembly)

a. Remove the friction arm (DS) (Removal Procedure No. 150).
b. Move the carriage far enough to the right (viewed from front) so as to make the left end of the carriage band accessible from underneath the machine.
c. Back up slightly on the spring barrel and, while holding the barrel, unhook the carriage band. Let the barrel slip slowly through the fingers to relieve the spring tension in the barrel. *(Note:* Unrestrained release of spring tension may damage the internal tension spring.)
d. Loosen the spring barrel shaft retaining screw.
e. Push the shaft far enough to the rear to clear the spring barrel and work the barrel out of the machine.
f. Mark the spring barrel and cover for assembly alignment purposes. A few strokes with a 3 corner file will leave a permanent, easily discernible alignment mark. Carefully pry off the barrel cover.
g. Remove the spring barrel spring. *(Note:* although the spring has been unwound to permit removal of the spring barrel, there is still tension on the spring due to its being coiled in the barrel. To remove the spring safely, unhook the spring from the sleeve, wrap the spring barrel in a heavy cloth, then pull the spring out of the barrel with a pair of pliers. To install a new spring: Attach the lead end of the coiled spring to the hook in the side of the spring barrel and the first loop behind the pole; place the spring so that the entire coil is in the barrel and the clip is resting on the rim of the barrel. Tap the spring, preferably with a wooden mallet, until it is free of the clip. Hook up the interior end of the spring to the sleeve.)

Reassembly Notes:

(1) Be sure the shaft is positioned so that the groove is facing up.
(2) Be sure that the spring barrel sleeve pin is aligned with the shaft groove.
(3) Be sure that the shaft retaining screw is tight in the shaft groove.

88. Carriage Band

a. Unhook the carriage band from the spring barrel (Removal Procedure No. 87 b,c). Rather than let the spring barrel run down, it is possible to hold it in place with a Vari-Typer part or tool.
b. Remove the band mounting screw from the bottom of the right carriage end.
c. Remove the band.

89. Trip Frame

a. Remove the carriage (Removal Procedure No. 64).
b. Remove the index head (Removal Procedure No. 44 or 45).
c. Remove the driver levers and shafts (Removal Procedure No. 48).
d. Remove the hammer (Removal Procedure No. 98).
e. Loosen one of the trip frame pivot screw lock nuts and back out the pivot screw until the trip frame is released, then remove the trip frame from the machine.

90. Hammer Escapement Wheel Assembly

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.
b. Move the carriage to the extreme left.
c. Loosen the front and remove the two rear tabulator bracket mounting screws.
d. Disconnect the motor-motor box shafts connecting spring, remove the three motor box mounting screws, and move the motor box out of the way to make the escapement accessible.
e. Unhook the repeat link lever return spring.
f. Remove the escapement actuating lever

mounting screw and remove the escapement wheel retainer.

g. Remove the push rod actuating lever retaining pin.

h. Depress the escapement push rod and work the escapement assembly out of the machine. Move the escapement push rod actuating lever out of the way to allow clearance for escapement assembly removal.

i. Remove the push rod and escapement wheel shaft pawl and spring.

j. Remove the eccentric screw lock nut and repeat latch.

k. Remove the nut which secures the rear hammer lever to the escapement pawl shaft, disconnect the pawl spring, and remove the hammer lever.

l. Separate the front lever from the escapement wheel and shaft.

Reassembly Notes:

(1) Be sure to replace all washers.

(2) Be sure the hammer levers are free on the escapement wheel shaft.

(3) When installing the escapement assembly, be sure that the pawl pin is positioned in the escapement actuating lever fork.

91. Escapement Wheel Pawl and Shaft

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.

b. Loosen the escapement actuating lever mounting screw and move the escapement wheel retainer clear of the hub.

c. Remove the eccentric screw lock nut and repeat latch.

d. Remove the nut and lock washer which secures the rear hammer lever to the escapement wheel pawl shaft. Unhook the pawl spring from the rear hammer lever.

e. Remove the nut and lock washer which secures the front hammer lever to the escapement wheel pawl shaft.

f. Disengage the rear hammer lever from the front hammer lever hub and the pawl shaft.

g. Remove the escapement wheel pawl and shaft.

Reassembly Notes:

(1) Be sure the pawl is free on its shaft.

(2) Be sure the pawl spring is properly attached to the pawl and rear hammer lever.

(3) Be sure the pawl pin is engaged in the escapement actuating lever fork.

92. Hammer Escapement Wheel Assembly (DS)

a. Remove the carriage escapement assembly and mounting bracket (Removal Procedure No. 119).

b. Remove the hammer eccentric screw, escapement pawl, and front hammer lever.

Reassembly Note:

Same as Removal Procedure No. 90

93. Escapement Wheel Pawl and Shaft (DS)

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.

b. Remove the justifier cam bracket (Removal Procedure No. 134).

c. Unhook the escapement pawl spring from the rear hammer lever.

d. Remove the two lock nuts and washers from the escapement wheel shaft.

e. Back off the eccentric screw nut.

f. Disengage the rear hammer lever from the hub of the front hammer lever and the escapement pawl shaft.

g. Remove the pawl, shaft, and spring.

Reassembly Note:

Same as Removal Procedure No. 91.

94. Escapement Actuating Lever

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.

b. Disconnect the repeat link lever return spring.

c. Loosen the two rear rubber foot mounting screws and remove the rear bottom cover brace.

d. Loosen the hammer stop nut lock screw and remove the hammer stop nut.

e. Remove the Forms Attachment suppressor block. (Removal Procedure No. 123).

f. Remove the two screws which secure the repeat bracket to the machine frame. (Machines with the Forms Attachment, these screws also mount the bell crank stops and actuating lever.)

g. Remove the escapement actuating lever mounting screw and, on Unit Spacing machines, the escapement wheel retainer.

h. Work the escapement actuating lever out of the machine.

Reassembly Note:

Be sure that the escapement pawl pin is engaged in the escapement actuating lever fork.

95. Gear Sleeve

a. Remove the hammer escapement wheel assembly (Removal Procedure No. 90).

b. Remove the sine shift link screw.

c. Remove the escapement shift fork shoulder and pivot screws. Then remove the fork.
d. Press down on the rack lift lever above the lift lever shaft and push the shaft out of the casting. Then remove the lift lever.
e. Block up the carriage escapement rack as high as possible and work the gear sleeve out of the machine.

Reassembly Note:

Be sure the sleeve rotates freely on the shaft and that the fork is properly fitted to the sleeve.

96. Gear Sleeve (DS)

a. Remove the carriage escapement assembly and mounting bracket (Removal Procedure No. 119).
b. Remove the escapement shift fork shoulder and pivot screws and remove the fork.
c. Press down on the rack lift lever above the lift lever shaft and push the shaft out of the casting. Then remove the lift lever.
d. Block up the escapement rack as high as possible.
e. Work the gear sleeve out of the machine.

Reassembly Note:

Same as Removal Procedure No. 95.

97. Spacing Shift Lever Shaft

a. Loosen the mounting screw and remove the shift lever extension.
b. Loosen the shift lever mounting screws.
c. Remove the shift lever lock.
d. Loosen the rack lift actuating lever set screws.
e. Remove the shift fork shoulder screw and the fork bushing.
f. Remove the motor box (Removal Procedure No. 109).
g. Slide the shift lever shaft out the rear of the machine.

98. Hammer

a. Remove the connecting plug from the electrical outlet and operate a keylever until the motor box locks up.
b. Remove the carriage assembly (Removal Procedure No. 64).
c. Remove the wayrod (Removal Procedure No. 85).
d. Unhook the hammer actuating spring and the suppressor spring from the hammer arm.
e. Loosen the lock nut and back out the hammer eccentric screw until it disengages the hammer swivel.
f. Remove the hammer stop nut.
g. Remove the spring clip and disconnect the shield connecting link from the shield actuating lever.
h. Loosen one of the hammer pivot screw lock nuts and back out the screw until the hammer shaft is released.
i. Work the hammer out of the machine *(Note:* On some machines it may be necessary to remove the center slide (Removal Procedures No. 83 or 84).
j. Strip the old hammer of the shield actuating lever, ribbon feed pawl, stop rod, swivel, and hammer face.

99. Ribbon Feed Pawl

a. Unhook the ribbon feed pawl spring.
b. Remove the hammer retarding bracket lock nut and the cover plate. *(Note:* To get more working room it may be desirable to first remove the horizontal ribbon feed shaft (Removal Procedure No. 40).
c. Remove the pawl and bracket.

100. Hammer Stop Rod

a. Remove the carriage (Removal Procedure No. 64).
b. Remove the wayrod (Removal Procedure No. 85).
c. Remove the justifier cam bracket (Removal Procedure No. 134).
d. Loosen the lock screw and remove the hammer stop nut.
e. Loosen the shield actuating lever set screws.
f. Machines with the Forms Attachment, remove the suppressor block.
g. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.
h. Unhook the hammer actuating spring.
i. Loosen the lock nut and back out the hammer eccentric screw until it disengages the hammer swivel.
j. Remove the stop rod mounting screw.
k. Push the hammer forward and lift the stop rod out of the machine.

Reassembly Notes:

(1) Be sure that the stop rod is positioned with the offset to the rear.
(2) Be sure that the stop rod is free with a minimum of side play.
(3) Leave the hammer actuating spring unhooked until the hammer eccentric screw tip is properly engaged with the swivel.
(4) Be sure the hammer eccentric screw tip does not bottom in the hammer.

101. Hammer Wheel

a. Remove the paper table (Removal Procedure No. 52).
b. Remove the lock nut.
c. Lift the hammer wheel off the pin and stud.

Reassembly Note:

The new hammer face must be tested for proper impression and resurfaced if necessary.

102. Hammer Spring Adjusting Bar

a. Unhook the hammer actuating spring from the bar.
b. Remove the spring clip from the suppressor link and disengage the link from the bar.
c. Remove the hammer spring adjusting bar extension.
d. Remove the hammer spring adjusting bar guide mounting screw.
e. Remove the hammer spring adjusting bar mounting screw and remove the bar and guide.

103. Suppressor Assembly

a. Remove the suppressor link shoulder screw.
b. Unhook the suppressor spring from the suppressor.
c. Straighten the three brass links. *(Note:* Work carefully to avoid breaking the links.)
d. Remove the two suppressor plate mounting screws.
e. Slide the assembly off the brass links and out of the machine.

104. Two-Increment Character Suppressor Bracket Assembly (519 and 565)

a. Remove the suppressor link shoulder screw and move the link aside.
b. Disconnect and remove the suppressor spring and suppressor spring bracket return spring.
c. Remove the left mounting screw and the suppressor spring bracket return spring mounting post (screw) which secure the bracket to the machine frame and remove the bracket assembly.

105. Two-Increment Character Suppressor Actuator Bracket (519 and 565)

a. Disconnect and remove the suppressor spring and spring bracket return spring.
b. Remove the two actuator bracket mounting screws and remove the bracket.

106. Two-Increment Character Suppressor Spring Bracket (519 and 595)

a. Disconnect and remove the suppressor spring and spring bracket return spring.
b. Remove the retaining spring clip from the spring bracket shaft.
c. Slide the bracket off the shaft.

107. Two-Increment Character Suppressor Actuator Arm and Shaft Latch (519 and 565)

a. Loosen the type drawer slide mounting screws and remove the type drawer.
b. Remove the three-increment shaft hub.
c. Disconnect the bail link from the two-increment shaft lever.
d. Loosen the set screw in the one and two-increment stop hub.
e. Loosen the actuator arm mounting screw.
f. Raise the two-increment shaft far enough to clear the latch and the actuator arm. The one and two-increment stop will drop off in the process.

108. Motor

a. Disconnect the motor-motor box shafts connecting spring.
b. Remove the two mounting screws and remove the motor.
c. Remove the motor shaft and coupling (DS).
d. Disconnect the motor lead wires.

109. Motor Box (Removal)

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.
b. Remove the lower right motor box rear plate mounting screw and remove the wire clamp. Replace the motor box rear plate mounting screw immediately after removing the clamp.
c. Disconnect the motor-motor box shafts connecting spring.
d. Remove the justifier cam bracket (Removal Procedure No. 134).
e. Remove the motor mounting screws and move it aside (DS).
f. Remove the three motor box mounting screws and remove the motor box from the machine. *(Note:* The two bottom screws also secure the Forms Attachment solenoid bracket.)
g. Disconnect the motor box switch wires from the switch. **CAUTION: When the motor box is locked and out of the machine, do not disdisassemble. See Removal Procedure No. 110 for disassembly procedure.**

Reassembly Note:

Be sure the motor box gear meshes without binding with the hammer escapement wheel.

110. Motor Box (Disassembly)

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until

the motor box locks up. With a screw driver, depress the motor box cam lever and unlock the motor box. Continue to alternately lock and unlock the motor box until all tension is removed from the motor box spring barrel. *(Note:* Be sure all spring tension is removed. Test by operating machine with the carriage rack lifted out of the gear sleeve until the hammer stays forward. If all spring tension has been removed, the motor box worm shaft can be turned with the fingers.)

b. Remove the motor box (Removal Procedure No. 109 b-g).
c. Unhook the motor box cam lever spring.
d. Loosen the set screw and remove the motor box gear (DS).
e. Remove the four front plate mounting screws and front plate.
f. Remove the cam lever.
g. Remove the adjusting spring and spacer (DS).
h. Remove the motor box gear.
i. Remove the motor box cam and cam sleeve.
j. Loosen the two top rear plate mounting screws and remove the spring barrel and shaft.
k. Mark the spring barrel and cover for re-alignment purposes. A few strokes with a three-corner file will leave a permanent, easily discernable alignment mark.
l. Carefully pry off the spring barrel cover, disconnect the spring from the shaft hook, and remove the shaft.
j. Remove the spring barrel spring. *(Note:* Although the spring barrel spring has been unwound to permit disassembly of the motor box, there is still tension on the spring due to its being coiled in the barrel. To remove the spring safely, wrap the spring barrel in a heavy cloth, then pull the spring out of the barrel with a pair of pliers. To install a new spring: Attach the lead end of the coiled spring to the hook in the side of the spring barrel and the first loop behind the pole; place the spring so that the entire coil is in the barrel and the clip is resting on the rim of the barrel. Tap the spring, preferably with a wooden mallet, until it is free of the clip.)

Reassembly Notes:

(1) Be sure the shaft and the spring barrel spring are attached.

(2) Be sure the cover is properly aligned and fully seated.

(3) Be sure the longer stud of the cam is toward the spring barrel.

111. Flying Dog (DS)

a. Move the carriage to the extreme right (viewed from the rear).
b. Unhook the flying dog spring from the flying dog actuating lever.
c. Slip the flying dog out of the carriage escapement wheel slot.

112. Flying Dog Actuating Lever (DS)

a. Move the carriage to the extreme right (viewed from the rear).
b. Remove the motor mounting screws and move the motor to the right allowing the motor shaft extension to disengage the motor box shaft.
c. Remove the spring clip and disconnect the actuating lever extension from the one-increment stop lever.
d. Remove the left one-increment space shaft bracket mounting screws (viewed from the rear).
e. Remove the spring clip and disconnect the bent link from the justifier operating shaft lever.
f. Unhook the flying dog spring from the actuating lever.
g. Unhook the actuating lever return spring.
h. Loosen the set screw and remove the actuating lever retaining collar.
i. Slide the actuating lever off the shaft, moving the one-increment space shaft down to obtain necessary clearance for the actuating lever extension.

113. Flying Dog Actuating Lever Shaft (DS)

a. Remove the carriage escapement assembly and mounting bracket (Removal Procedure No. 119).
b. Remove the actuating lever shaft and lever pin and remove the lever.
c. Slide the shaft out of the mounting bracket.

114. Carriage Escapement Wheel and Ratchet (DS)

a. Remove the motor box (Removal Procedure No. 109).
b. Remove the flying dog actuating lever (Removal Procedure No. 112).
c. Remove the two flying dog release lever bracket mounting screws. Pivot the bracket out of the way.
d. Hold the gear sleeve to keep it from turning and remove the retaining screw in the end of the carriage escapement shaft.
e. Slide the carriage escapement wheel and sleeve off the shaft.
f. Pull the ratchet off the key and slide it off the shaft.

115. Two-Increment Shaft (DS)

a. Loosen the type drawer slide mounting screws and remove the type drawer.
b. Remove the spring clips and disconnect the two and three-increment bail links from the two and three-increment shaft hubs.
c. Loosen the set screw and remove the three-increment shaft hub.
d. Loosen the set screw in the two increment stop
e. Slide the two increment shaft out of the front of the machine removing the stop in the process.

116. Two-Increment Stop (DS)

a. Remove the spring clip and disconnect the flying dog actuating lever extension from the one-increment stop lever.
b. Remove the left (viewed from the rear) one-increment space shaft bracket mounting screws.
c. Loosen the two-increment stop set screw, depress the one-increment space shaft for necessary clearance, and slide the stop off the two-increment shaft.

117. Three-Increment Shaft and Stop (DS)

a. Loosen the three-increment shaft hub set screw.
b. Remove the two-increment stop (Removal Procedure No. 116).
c. Slide the three-increment shaft and stop out of the rear of the machine, disengaging the hub, and depressing the one-increment shaft for clearance.

118. One-Increment Space Shaft (DS)

a. Disconnect the one-increment space link return spring.
b. Remove the spring clip and disconnect the one-increment link from the one-increment shaft arm.
c. Remove the spring clip and disconnect the flying dog actuating lever extension from the one-increment stop lever.
d. Remove the spring clip from the end of the one-increment space shaft.
e. Remove the left (viewed from rear) one-increment space shaft bracket mounting screws.
f. Remove the assembly from the machine.
g. Loosen the set screws in the one-increment stop, stop lever, and arm and remove from the shaft.

119. Carriage Escapement Assembly and Mounting Bracket (DS)

a. Remove the machine from the case (Removal Procedure No. 1).
b. Remove the justifier cam bracket (Removal Procedure No. 134).
c. Remove the three-increment shaft and stop (Removal Procedure No. 117).
d. Remove the flying dog actuating lever (Removal Procedure No. 112).
e. Remove the motor box (Removal Procedure No. 109).
f. Remove the flying dog release lever bracket mounting screws. Pivot the bracket away from the carriage escapement wheel and allow it to hang.
g. Remove the spring clip and disconnect the repeat latch link from the repeat shaft lever.
h. Hold the gear sleeve to prevent it from turning and remove the retaining screw from the end of the escapement shaft.
i. Remove the carriage escapement wheel and sleeve from the shaft.
j. Pull the ratchet straight back and slide it off the shaft. Do not twist the ratchet as it is keyed to the shaft.
k. Remove the spring clip and disconnect the Forms Attachment solenoid link from the Forms Attachment actuating lever. Remove the link and plunger.
l. Remove the six mounting bracket mounting screws and slide the bracket off the locating pins and escapement shaft. *(Note:* Check for shims between the mounting bracket and the frame.)
m. Remove the hammer escapement wheel and the escapement shaft.

Reassembly Notes:

(1) Be sure that the hammer eccentric tip engages the hammer swivel and that the escapement wheel pawl pin engages the actuating lever fork.

(2) Tighten the mounting bracket mounting screws gradually and alternately to avoid tilting the bracket and creating a bind. Disengage the escapement rack from the gear sleeve and test for binds. The sleeve and shaft should spin freely. If bind exists re-check mounting bracket position.

120. Forms Attachment Motor

a. Remove the connecting cord plug from the electrical outlet.
b. Remove the two base plate mounting screws

and separate the base plate from the cover.
c. Remove the two screws which mount the cover to the side of the case.
d. Disconnect the motor lead wires from the motor. *(Note:* These are soldered connections.)
e. Force the cam off the motor shaft.
f. Remove the two motor mounting screws. Remove the motor and spacers.

Reassembly Note:

Motor lead wires must be re-soldered to the motor.

121. Forms Attachment Toggle Switch and Handle

a. Remove the connecting cord plug from the electrical outlet.
b. Remove the two base plate mounting screws and separate the base plate from the cover.
c. Remove the two screws which mount the cover to the side of the case.
d. Remove the hex nut which secures the switch to the cover and push out the switch and handle.
e. Disconnect the lead wires. *(Note:* These are soldered connections.)
f. Push out the pin and remove the handle.

122. Forms Attachment Solenoid and Plunger

a. Remove the connecting cord plug from the electrical outlet and operate a keylever until the motor box locks up.
b. Disconnect the two solenoid lead wires from the terminal block.
c. Remove the two bottom motor box mounting screws and slide the solenoid and bracket off the plunger.
d. Remove the four solenoid mounting screws and separate the solenoid from the bracket.
e. Remove the spring clip and disconnect the solenoid link from the Forms Attachment actuating lever.
f. Lift out the plunger and link.

123. Forms Attachment Suppressor Block

a. Unhook the suppressor block spring.
b. Remove the spring clip holding the block to the actuating lever stud.
c. Lift the suppressor block off the stud and remove from machine.

124. Forms Attachment Actuating Lever and Bracket

a. Remove the space bar holder link.
b. Remove the spring clip and disconnect the repeat latch link from the repeat shaft lever.
c. Loosen the set screw in the repeat shaft retaining collar.
d. Remove the suppressor block (Removal Procedure No. 123).
e. Remove the two terminal bracket mounting screws.
f. Remove the spring clip and disconnect the solenoid link from the actuating lever.
g. Remove the tabulator reed mounting screw and nut.
h. Remove the left and right bell crank stop mounting screws and lift out the bell cranks. These screws also secure the actuating lever bracket and the repeat shaft bracket to the machine frame.
i. Work the actuating lever and bracket out of the machine.
j. Remove the spring clip and slide the actuating lever off the bracket stud.

125. Sine Shift Shaft and Ratchet Assembly

a. Move the carriage to the extreme right (viewed from the front).
b. Loosen the set screw in the sine shift shaft actuating lever and in the shaft retaining collar. Remove the pin from the actuating lever hub.
c. Remove the two sine bar lifting link mounting screws.
d. Remove the shaft and ratchet assembly. Slide the ratchet assembly off the shaft.

126. Sine Bar and Horizontal Track

a. Set the actuating bar at its lowest point.
b. Remove the spring clip from the sine bar block stud and remove the horizontal track.
c. Disengage the sine bar from the stud and slide out of the sine cradle.

127. Sine Ratchet Pawl and Shaft

a. Move the carriage to the extreme right (viewed from the front).
b. Disconnect the ratchet pawl spring from the justifier selector plate.
c. Remove the pawl shaft nut and lock washer.
d. Lift out the pawl and shaft.

128. Sine Shift Lever and Block

a. Remove the shoulder screw which joins the sine shift lever to the sine shift link.
b. Remove the sine block mounting screw and pull the block off the justifier selector plate.
c. Lift the shift lever out of the block.

Reassembly Note:

Be sure that the tip of the lever properly engages the ratchet pawl and that the sine block pin is aligned with the hole in the selector plate.

129. Sine Cradle

a. Remove the spring clip from the sine cradle stud.

b. Disengage the stud from the sine bar guide and slide the cradle off the sine bar.

130. Justifier Selector Pointer Assembly

a. Remove the actuating bar lock nut and shoulder screw.

b. Loosen the thumb screw and slide the pointer assembly off the bar. *(Note:* Rotating the bar so that the pointer assembly is inverted will prevent the justifier selector plug from dropping out as the pointer assembly clears the end of the bar. The plug can then be extracted.)

c. Mark the position of the pointer. Then remove the mounting screws and separate the pointer, actuating bar lock, and block from the housing.

Reassembly Notes:

(1) Invert the pointer assembly and insert the plug in the slot in the block.

(2) Reverse the procedure outlined in the note in Step b.

(3) Be sure the pointer is correctly re-aligned.

131. Column Selector Pointer Assembly

a. Remove the spring clip and disengage the horizontal track and sine bar from the sine bar block stud.

b. Remove the column selector pointer mounting screws and separate the column selector pointer, block pointer, sine bar block, and selector block from the housing. *(Note:* When the selector block is removed the plug will drop out. Be sure that it is returned during reassembly.)

c. Disengage the housing from the column rack.

132. Justifier Actuating Bar

a. Remove the right mounting screw (viewed from rear).

b. Remove the lock nut and shoulder screw.

c. Remove the bar.

133. Justifier Bell Crank

a. Remove the justifier actuating bar (Removal Procedure No. 132).

b. Remove the mounting screw and slide the bell crank off the pin.

Reassembly Note:

Be sure the lower arm is engaged in the escapement rack bracket.

134. Justifier Cam Bracket (DS).

a. Remove the actuating bar (Removal Procedure No. 132).

b. Remove the spring clip and disconnect the bent link from the justifier cam operating shaft lever.

c. Remove the spring clip and disconnect the crank connecting link from the space crank.

d. Remove the spring clip and disconnect the proportional bar slide link from the justifier setting shaft arm.

e. Remove the three justifier cam bracket mounting screws and work the assembly out of the machine. *(Note:* In the process disengage the frame latch operating rod from the friction lock rod lever and the reset rod from the reset lever.)

135. Reset Shaft and Lever (DS)

a. Remove the machine from the case (Removal Procedure No. 1).

b. Remove the motor and set it aside (Removal Procedure No. 108 a-c).

c. Remove the two reset shaft bearing mounting screws and remove the bearing.

d. Loosen the set screw and remove the pin from the reset shaft lever.

e. Rotate the shaft to clear the reset rod and pull the shaft and lever out of the rear of the machine.

136. Justifier Setting Shaft (DS)

a. Remove the reset shaft and lever. (Removal Procedure No. 135).

b. Loosen the setting shaft lever set screw.

c. Remove the spring clip and disconnect the proportional bar slide link from the setting shaft arm.

d. Draw the shaft out of the rear of the machine.

137. Justifier Cam Operating Shaft (DS)

a. Remove the pin which secures the operating shaft lever to the right (viewed from the rear) end of the cam operating shaft.

b. Remove the operating shaft bearing mounting screws.

c. Slide the cam operating shaft out of the cam bracket.

138. Justifier Cam and Bell Crank (DS)

a. Unhook the justifier bell crank return spring.

b. Loosen the cam return spring mounting screw lock nut and draw the end of the spring out of the screw.

c. Unscrew the justifier cam shaft and remove it from the cam bracket.

d. Lift the cam and the bell crank out of the bracket.

Reassembly Note:

Be sure to replace any shims which may have been released when the cam shaft was removed.

139. Justifier Cam Follower (DS)

a. Disengage the justifier cam follower return finger from the cam follower.
b. Unscrew the cradle shaft and withdraw it far enough to clear the cam follower hub.
c. Lift the cam follower out of the assembly.

140. Proportional Bar Slide (DS)

a. Remove the spring clip and disconnect the proportional bar slide link from the justifier setting shaft arm.
b. Remove the cradle roller and stud.
c. Slide the proportional bar slide off the cradle arm.

141. Ratchet Housing and Ratchets (DS)

a. Loosen the feed ratchet spring mounting screw and disengage the spring from the ratchet.
b. Remove the check ratchet springs.
c. Remove the justifier cam follower (Removal Procedure No. 139) and cradle shaft.
d. Remove the four ratchet housing mounting screws and lift the housing and adjusting bracket out of the justifier assembly.
e. Slide the ratchets out of the housing.

142. Justifier Cam Follower Rack Release (DS)

a. Remove the spring clip and disconnect the justifier cam follower rack release connecting link from the cradle lever.
b. Remove the justifier cam follower (Removal Procedure No. 139) and cradle shaft.
c. Lift out the release rack.

143. Justifier Frame Latch (DS)

a. Lock up the actuating bar.
b. Unlatch the justifier cradle and allow it to drop to its lowest point.
c. Unhook the frame latch spring.
d. Remove the latch mounting screw and the latch.

144. Justifier Cam Follower Return Finger (DS)

a. Unhook the justifier cam follower return finger spring.
b. Remove the spring clip and lift the return finger off the stud.

145. Justifier Cradle (DS)

a. Lock up the actuating bar.
b. Remove the spring clip and disconnect the proportional bar slide link from the justifier setting shaft arm.
c. Unhook the cradle tension spring.
d. Remove the spring clip and disconnect the justifier cam bell crank link from the bell crank. Remove the link.
e. Remove the justifier cam follower (Removal Procedure No. 139) and cradle shaft.
f. Remove the cradle assembly from the machine.

146. Justifier Cam Reset Lever (DS)

a. Remove the justifier cam bracket (Removal Procedure No. 134).
b. Remove the justifier cam reset rod (Removal Procedure No. 148).
c. Remove the reset lever mounting screw and lift off the spacer and lever.

147. Justifier Cam Reset Lock (DS)

a. Remove the justifier cam bracket (Removal Procedure No. 134).
b. Unhook the reset lock spring.
c. Remove the reset lock mounting screw and lift off the spacer and reset lock.

148. Justifier Cam Reset Rod (DS)

a. Remove the lock and adjusting nuts from the end of the reset rod.
b. Loosen the adjusting collar set screws.
c. Work the reset rod out of the machine.

149. Latch Operating Rod (DS)

a. Remove the justifier cam bracket (Removal Procedure No. 134).
b. Loosen the set screws in the collars on the shaft.
c. Pull the shaft out of the cam bracket.

150. Friction Arm (DS)

a. Move the carriage to the extreme right (viewed from the front).
b. Remove the justifier center slide link mounting screw.
c. Move the carriage to the left (viewed from the front).
d. Remove the spring clip and disconnect the proportional bar slide link from the justifier setting shaft arm.
e. Rotate the justifier setting shaft to the extreme right (viewed from the rear).
f. Disconnect the friction arm tension spring from the spring mounting stud.
g. Remove the spring clip from the friction arm shaft and slide the arm out of the machine.

Reassembly Note:

Be sure the step portion of the friction arm is behind the lock rod and that the friction arm spring is properly attached.

151. Friction Lock Rod (DS)

a. Remove the spring clip holding the lock rod compression spring.
b. Lift out the lock rod and spacer; remove the compression spring as it is released.

c. Remove the lock and adjusting nuts from the lock rod.

152. Friction Block (DS)

a. Position the proportional bar slide and justifier cradle to make the friction block mounting screws accessible.
b. Remove the mounting screws and the block.

153. Friction Lock Rod Lever (DS)

a. Remove the friction lock rod (Removal Procedure No. 151).
b. Remove the lock rod lever shaft spring clip.
c. Slip the shaft out toward the rear of the machine and lift out the lever as it is released.

154. Solenoid (330)

a. Disconnect the solenoid leads from the mounting plate terminal block.
b. Remove the six solenoid mounting screws and remove the solenoid.

155. Solenoid Plunger (330)

a. Remove the roll pin securing the solenoid plunger to the plunger block.
b. Remove the solenoid mounting screws.
c. Remove the plunger from the solenoid.

156. Solenoid Plunger Block (330)

a. Remove the roll pin securing the solenoid plunger to the plunger block.
b. Push the plunger into the solenoid.
c. Remove the roll pin which secures the plunger block to the plunger lever and remove the block.

157. Plunger Lever (330)

a. Disconnect the plunger lever return spring from its mounting stud.
b. Remove the plunger block roll pin.
c. Remove the nut and washer which secures the left mounting plate brace (viewed from the rear), plunger lever, and spacer to the mounting plate.
d. Remove the plunger lever and spacer.

158. Hammer Lever and Pawl (330)

a. Disconnect the pawl actuating spring from its mounting stud.
b. Remove the nut and flat washer which secures the hammer lever, pawl, and spacers to the mounting plate.
c. Remove the hammer lever and pawl from the spacer.

159. Pawl Trip Lever (330)

a. Disconnect the pawl trip lever return spring from its mounting stud.
b. Remove the spring clip from the pawl trip lever shaft.
c. Remove the pawl trip lever from its shaft.

160. Roller Bracket (330)

a. Disconnect the hammer return spring from the hammer roller bracket.
b. Remove the hammer roller mounting screw shaft nut and lock washer. Remove the screw stud and roller.
c. Remove the hammer roller bracket mounting screw shaft nut and lock washer and remove the shaft.
d. Loosen the hammer throw adjustment lock nut and the hammer impression spring adjustment lock nut.
e. Turn the hammer actuating spring screw counterclockwise until it is free from the hammer. Remove the nuts, washers, spring, and screw.
f. Remove the hammer roller bracket.

161. Case (270 and 660)

a. Remove the rear cover.
b. Raise the front cover and remove it by springing the pivot arms in to slip them off the pivot studs.
c. Remove the standard shift actuating lever bracket mounting screws and remove the lever and bracket.
d. Turn the machine on its back and loosen the bottom plate mounting screws and remove the plate.
e. Remove the spring clip from the spacing shift lever extension pivot shaft and remove the shaft. Work the extension lever out the bottom of the machine.
f. Unscrew the machine switch lock nut.
g. Disconnect the machine indicator light lead wires.
h. Remove the screws from the type change, impression control, and non-print actuating lever buttons and remove the buttons.
i. Remove the two upper keyboard cover mounting screws. Pull open the type drawer and loosen the two lower mounting screws and remove the keyboard cover.
j. Remove the two rear and either front machine mounting screws.
k. Place the machine on its feet and slide the front over the edge of the desk and remove the remaining front mounting screw.
l. Lift the machine out of the case, twisting it slightly so that the space bar bracket clears the upper space bar stops.
m. Insert four metal feet in the machine mounting

screw holes before setting the machine on the desk.

162. Keylevers (270 and 660)

a. Remove the keyboard cover (Removal Procedure 161b, c, d, g, h, and i).
b. Remove the keylever retainer mounting screws and remove the retainer.
c. Lift out the keylevers. Before removing the suppressed keys (comma, period, and hyphen), the brass links must be straightened so that they can be lifted out of the suppressor.

163. Cap Shift Keylever (Left) (270 and 660)

a. Move the keyboard cover aside (Removal Procedure 161b, c, h, and i).
b. Remove the keylever retainer mounting screws and remove the retainer.
c. Remove the spring clip from the end of the shift keylever pivot shaft and remove the shaft.
d. Lift the one-increment space keylever out of the way.
e. Loosen the set screw in the retaining collar on the anvil lift lever shaft and move it away from the keylever.
f. Remove the spring clip holding the type change lever and type change link and move the lever clear of the shift keylever.
g. Raise the shift keylever to the vertical position and slip it off the anvil lift lever shaft.

164. Fig Shift Keylever (Left) (270 and 660)

a. Move the keyboard cover aside (Removal Procedure 161 b, c, h, and i).
b. Remove the keylever retainer mounting screws and remove the retainer.
c. Remove the spring clip form one end of the shift keylever pivot shaft and remove the shaft.
d. Move the repeat keylever clear of the shift keylever and remove the shift keylever eccentric screw. Lift out the keylever.
e. Slip the shift keylever link off the anvil lift lever shaft.

165. Cap Shift Keylever (Right) (270 and 660)

a. Move the keyboard cover aside (Removal Procedure 161 b, c, h, and i).
b. Remove the keylever retainer mounting screw and remove the retainer.
c. Remove the two ribbon cup mounting screws and remove the ribbon cup.
d. Loosen the set screw in the retaining collar on the anvil lift lever shaft and move it away from the shift keylever.
e. Raise the shift keylever to the vertical position and slip it off the anvil lift lever shaft.

166. Fig Shift Keylever (Right) (270 and 660)

a. Move the keyboard cover aside (Removal Procedure No. 161 b, c, h, and i).
b. Remove the keylever retainer mounting screws and remove the retainer.
c. Remove the two ribbon cup mounting screws and remove the ribbon cup.
d. Remove the shift keylever eccentric screw.
e. Loosen the set screw in the collar on the shift keylever pivot shaft and remove the collar and keylever.
f. Slip the shift keylever link off the anvil lift lever shaft.

167. Back Space Keylever (270 and 660)

a. Remove the right fig shift keylever (Removal Procedure No. 166 a-e).
b. Raise the back space keylever to the vertical position and slip it off the anvil lift lever shaft.

168. Cap and Fig Shift Keylever Lock Brackets (270 and 660)

a. Move the keyboard cover aside (Removal Procedure No. 161 b, c, h, and i).
b. Remove the lock bracket mounting screws and work the brackets out under the keylevers.

169. Standard Shift Arm and Link (660)

a. Remove the standard shift arm mounting nut and lift the arm off its pivot stud.
b. Remove the standard shift link shoulder screw and remove the link.

170. Impression Control Actuating Lever (270 and 660)

a. Remove the machine from the case (Removal Procedure No. 161).
b. Remove the spring clip holding the impression control actuating lever and link and separate the lever and link.
c. Remove the type change actuating lever torsion spring.
d. Loosen the two set screws in the hub of the type change actuating lever and remove the lever.
e. Remove the Forms Attachment actuating switch bracket mounting screws and move the bracket aside.
f. Through the holes in the impression control bracket, remove the bracket mounting screws and lift out the bracket.
g. Remove the spring clip from the end of the impression control actuating lever pivot stud.
h. Remove the impression control ratchet mount-

ing screws. Rotate the actuating lever 180 degrees and slip it off the pivot stud.

i. Unhook the actuating lever tension spring.

j. Remove the spring clip from the stud on the impression control actuating lever (upper) and separate the upper and lower portions of the actuating lever.

171. Type Change Shaft (270 and 660)

a. Remove the machine from the case (Removal Procedure No. 161).

b. Remove the type change actuating lever torsion spring.

c. Loosen the set screws in the hub of the type change actuating lever and remove the lever.

d. Remove the two spring clips from the type change shaft.

e. Loosen the set screws in the hub of the type change link and slide the shaft out of the machine.

172. Forms Attachment Motor (270 and 660)

a. Disconnect the Forms Attachment motor lead wires.

b. Remove the Forms Attachment motor mounting bracket by removing the two wayrod support mounting screws. *(Note:* Check for washers between the mounting bracket and the wayrod support.)

c. Remove the two motor mounting screws from the motor support bracket and separate the motor and support bracket.

173. Forms Attachment Actuating Switches (270 and 660)

a. Move the keyboard cover aside (Removal Procedure No. 161 b, c, h, and i).

b. Remove the type drawer cover mounting screws and remove the cover, type drawer, and type drawer slides.

c. Remove the switch mounting screws and remove the actuator stop.

d. Disconnect the switch lead wires.

174. Ribbon Feed Shaft (270 and 660)

a. Remove the machine from the case (Removal Procedure No. 161).

b. Loosen the set screws in all collars and gears on the shaft and slide the shaft out the right side of the machine.

175. Ribbon Take-Up Motor (270 and 660)

a. Disconnect the ribbon take-up motor lead wires.

b. Remove the motor bracket mounting screws.

c. Remove the motor mounting screws from the motor bracket and lift out the motor.

Reassembly Note:

Make sure the spring belt and motor shaft pulley are engaged before the motor is mounted to the motor bracket.

176. Ribbon Take-Up Reel Shaft (270 and 660)

a. Remove the outer portion of the ribbon take-up reel.

b. Remove the adjusting and lock nuts from the take-up reel shaft and remove the spring clutch assembly and the inner portion of the take-up reel.

c. Loosen the set screws in the take-up reel shaft pulley and pull the shaft out of its bracket.

177. Machine Switch (270 and 660)

a. Disconnect the switch lead wires.

b. Remove the switch lock nut and remove the switch from the machine.

178. Machine Indicator Light (270 and 660)

a. Remove the keyboard cover (Removal Procedure No. 161 b, c, d, g, h, and i).

b. Remove the indicator light speed nut and lift the light out of the keyboard cover.

179. Spacing Shift Lever Extension (270 and 660)

a. Remove the spring clip from one end of the spacing shift lever extension pivot shaft and remove the shaft.

b. Work the lever extension out of the machine.

180. Spacing Shift Lever (270 and 660)

a. Remove the spacing shift lever extension (Removal Procedure No. 179).

b. Loosen the set screws in the hub of the spacing shift lever.

c. Loosen the set screws in the hub of the rack lift actuating lever.

d. Remove the spacing shift fork shoulder screw from the spacing shift shaft bushing.

e. Slide the spacing shift shaft toward the rear of the machine to obtain clearance and slide the spacing shift lever off the shaft.

181. Margin Dial Cup Compression Spring (660)

a. Loosen the margin dial pointer mounting screw and remove the pointer.

b. Loosen the set screw in the hub of the margin dial and remove the dial and cup.

c. Lift out the compression spring.

182. Non-Print Shaft (660)

a. Remove the machine from the case (Removal Procedure No. 161).

b. Loosen the set screws in all collars and hubs on the shaft.

c. Slide the shaft out the right side of the machine.

183. *Carbon Ribbon Feed Bracket Assembly (270 and 660)*

a. Remove the ribbon take-up reel (Removal Procedure No. 176 a-b).

b. Remove the upper bracket mounting screw.

c. Loosen the set screw in the retaining collar on the vertical shaft and raise the collar clear of the lower mounting screw.

d. Remove the lower mounting screw and lift out the bracket.

ADJUSTMENTS

1. Anvil (Figure 14)

a. The anvil shaft must be perfectly free in the index head bushing in which the shaft is supported. When checking a DS machine, it will be necessary to hold the bail bars as far forward as possible. If the shaft is sticking in the bushing, remove the anvil and clean the shaft and bushing. Place a drop of light oil on the shaft and work it in the bushing until the anvil drops freely of its own weight.

If cleaning and lubrication do not eliminate the bind, polish the shaft with fine emery cloth or steel wool. *Do not attempt to enlarge the bushing opening by any means.*

The anvil shaft might also stick in the shuttle arm bushing. This can be quickly determined by removing the shuttle arm and testing the anvil in the index head bushing. If it is free in the index head bushing, it is safe to assume that it is the shuttle arm bushing which is causing the bind. Polish the inside of the shuttle arm bushing with a piece of fine emery cloth rolled up to fit snugly in the bushing.

b. The anvil locating pin must hold the anvil steady, but must not impede the operational freeness of the anvil. If the anvil does bind on the locating pin, the condition can be corrected by straightening the pin. To make the adjustment, place the anvil in the position where it binds. While in this position, apply pressure to the locating pin in different directions until the anvil drops freely of its own weight. When the direction in which the pin must be moved has been determined, place wrench 09-0126-0 over the pin and force it lightly in the proper direction. Test again for freeness. After the anvil drops freely, check the locating pin mounting nut to insure that forming the pin did not loosen it.

c. The anvil height adjusting screw determines the height at which the anvil must rest in its unoperated position (lower case). This position must be adjusted in relation to the fixed vertical position of the hammer face so that when the hammer strikes the lower case row on the type font, the entire character will print. If the anvil's rest position is set too high, characters with ascenders such as "d" and "b" may be cut off at the top or there may be marking below the characters. If set too low, characters with descenders such as "g" and "y" may be cut off at the bottom.

Before making any adjustment, the anvil should be checked to make certain it is resting securely on the anvil height adjusting screw. If the anvil is not bottoming on the screw, check the following items: anvil binding on locating pin; anvil shaft binding in index head bushing or shuttle arm bushing; anvil shaft bottoming on anvil lift lever when lift lever is in unoperated position; anvil hitting idle pin or bracket; type font bushing too tight on shuttle arm pin. If any of these conditions, or any other conditions do exist, they must be corrected before the anvil height adjustment can be properly made.

To test the anvil height setting, insert the VariTyper test type in the anvil and strike keylever No. 18 in lower case, without paper in the machine. The anchor symbol imprinted on the hammer face should be complete, without any sign of a flat either at the top or the bottom of the symbol (Figure 60). (*Note:* #1900 Vari-Clear Ribbon will not print on the hammer face. To overcome this, place a piece of carbon paper between the hammer face and the type.)

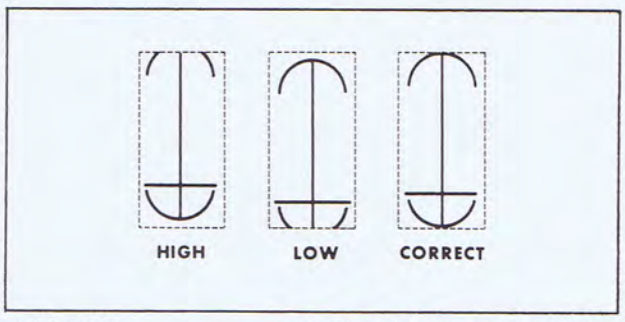


FIGURE 60 ANVIL HEIGHT ADJUSTMENT

If a test type is not available, select the largest type available in the machine and imprint the lower case "g" on the hammer face. The tail of the descender should be about .001" to .002" above the bottom edge of the hammer face.

To adjust, loosen the anvil height adjusting screw lock nut and turn the screw counter-

clockwise to raise the anvil's rest position; clockwise to lower it. Retighten the lock nut to secure the adjusting screw and recheck to be sure the anvil is bottoming on the screw.

After adjusting the anvil height, the capital and figure shift adjustments must be remade to coincide with the new anvil height (See Adjustment No. 3).

d. The anvil yoke holds the type font so that the bushing is centered over the shuttle arm pin or idle bracket pin when the anvil is rotated and dropped over the locating pin. It must be free to move up and down under the tension of the anvil yoke spring which holds the yoke in the unoperated position during normal machine operation.

In the rest position, there must be sufficient clearance between the yoke and the type font bushing to assure free movement of the type font above the yoke. When the anvil is lifted, the yoke must hold the type font bushing with little or no contact of the type web. If the yoke lifts the font to high, there is the possibility that the web will become bent. Adjustment is made by forming the yoke cut-out arms up or down.

There must be some clearance between the type font bushing and the yoke cutout when the yoke is in the raised position. Lack of clearance will cause the yoke to bind on the bushing and prevent it from returning to un-operated position. This condition can be corrected by filing some material off the inside of the yoke cutout where it contacts the type bushing. Care must be taken to file only enough to eliminate the bind.

During normal machine operation, the yoke cutout arm tips must not contact the shuttle arm pin and interfere with the shuttle arm's movement. If this condition does exist, file some material off the yoke cutout arm tips to obtain clearance.

The yoke arms must be parallel to the anvil and have a minimum of end play. To obtain parallelism, form the arms up or down so that both arms contact the anvil at the same time. End play is obtained by filing some material from the arms to obtain play or peening to reduce play. Also, the arms serve to align the yoke cutout arms with the shuttle arm pin and the idle bracket pin. To adjust, peen one of the arms to rotate the yoke and then readjust for end play.

e. The anvil face and slot must be clean. A dirty anvil face or slot will impede free type font activity. Clean the anvil face with a cloth dampened in a suitable solvent. Clean the anvil slot with a library card or piece of paper folded to its equivalent thickness.

Never allow oil or grease to get into the anvil slot.

2. *Anvil Lift Lever Shaft (Figure 1)*

The anvil lift lever shaft must rotate freely on its pivot screws with no side play. To test the lift lever shaft, lift the anvil and rotate it one-quarter turn to lock it up on the locating pin, then grasp the shaft and check for freedom of rotation and side play. If the shaft is binding, loosen one of the lift lever shaft pivot screw lock nuts or lock screws and back out the pivot screw slightly. If the shaft has to much side play, take up the lost motion by tightening one of the pivot screws. Make sure the capital and figure shift keylevers have a slight amount of side play between the lift lever shaft dogs and the frame. Tighten the pivot screw lock nuts or lock screws to hold the adjustment.

The anvil lift lever is pinned to the lift lever shaft and normally contacts the anvil shaft slightly off center. There must be a slight amount of travel left in the lift lever shaft when the anvil is bottomed on the height adjusting screw. Adjustment is made by forming the lift lever.

3. *Cap and Fig Alignment (Figures 15 and 16)*

The cap and fig shift keys must be adjusted so that when they are operated they will lift the anvil to the proper height to align the base lines of the upper case and figure row characters with the base line of the lower case characters. Before checking cap and fig alignment, make sure Adjustments 1 and 2 are correct.

To test the alignment, insert the VariTyper test type in the anvil and strike key No. 13 in lower case, cap and fig positions using the left shift keys. The three short lines should print as one continuous straight line. The lower case line has one tic mark, cap has two, and fig has three. If the line in the cap position is higher than the line in lower case, loosen the left cap shift adjusting screw lock nut using wrench 09-0125-0 and turn the screw in to shorten the keylever stroke, thereby reducing the height to which the anvil will be raised. Retighten the adjusting screw lock nut and test the alignment.

Repeat the procedure until the lines are perfectly aligned (Figure 61).

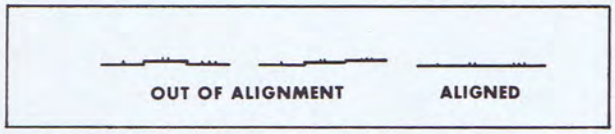


FIGURE 61 CAPITAL and FIGURE SHIFT ADJUSTMENT

If the line in cap position is lower than in lower case, back out the adjusting screw to increase the keylever stroke, thereby increasing the height to which the anvil will be raised.

Test the fig shift position and adjust in the same manner.

Repeat the same tests and adjustments for the cap and fig shift keys on the right side of the keyboard.

If a test type is not available, use any type font and the lower case "z" and upper case "Z" for cap shift key test, and lower case "z" and figure "2" for fig shift key test.

After the cap and fig alignment adjustments have been made, the shift key locks should be checked, and if required, adjusted.

When the shift key lock levers are operated, the levers should slide under the shift lever locks freely and hold the shift keys securely in their operated position.

To make the adjustment, loosen the lock mounting screw, operate the shift key and lock lever, then position the lock so it contacts the lock lever and retighten the lock mounting screw. Check for freedom of operation and absence of lost motion between the lock lever and the lock. Adjust both locks in the same manner.

The cap and fig shift keylevers are held in unoperated position by compression springs in the outer comb. The purpose of these springs is to prevent the remaining shift keylevers from dropping when one of the levers is operated. These springs should be checked occasionally to make sure they are not damaged, since a damaged spring could interfere with proper operation of the shift keylever.

4. *Cap and Fig Alignment (Mathematical Attachment) (Figure 62)*

The left cap and fig shift keylever adjustments are the same as in conventional machines (Adjustment No. 3). The denominator (cap) and numerator (fig) shift keylevers are adjusted by means of adjusting screws on the stop lever and and plate assembly. The stop lever must be shifted to the left in order to position the adjusting screws directly below the shift levers. Loosen the adjusting screw lock nuts and turn the screws clockwise to lower the cap or fig baseline; turn the adjusting screws counterclockwise to raise the baseline. Retighten the lock nuts to maintain the adjustment.

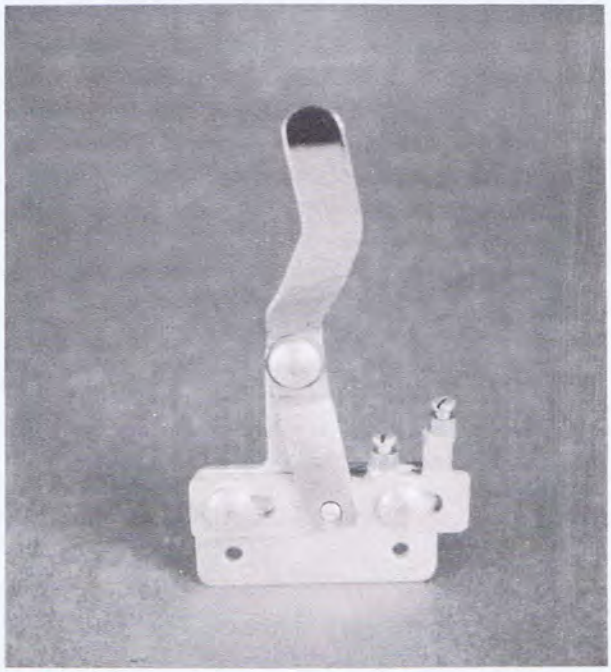


FIGURE 62 MATHEMATICAL ATTACHMENT (Lever and Plate Assembly)

5. *Denominator and Numerator Alignment (Figure 62)*

To adjust the denominator and numerator shift keys, insert a four-row mathematical type in the anvil and engage the mathematical attachment by moving the stop lever to the right. This will remove the cap and fig adjusting screws from below the levers and permit them to be depressed farther down. The denominator and numerator adjusting screws are located in the machine frame and are the same screws which normally are used for adjusting the cap and fig alignment in conventional machines.

a. *To adjust the denominator alignment:* depress the denominator shift key and print the character pi π a few times, then release the shift key and print the same number of lower case "m's". The base lines of both characters should be in alignment with each other. Adjustment is made by loosening the denominator shift key adjusting screw lock

nut and turning the screw in to lower or out to raise the character pi to match the lower case "m" base line.

b. *To adjust the numerator alignment:* remove the paper from the machine. Depress the numerator shift key and print any number on the hammer face. The impression on the hammer face should be as close as possible to the top edge of the hammer face. Adjustment is made by loosening the numerator shift key adjusting screw lock nut and turning the adjusting screw in to lower the imprinted number if it is running off the hammer face; turn the screw out if the number is to far from the top edge of the hammer face.

With the adjustments made in this manner, the resulting distance of exponent characters above capital letters will be the same distance that subscript characters drop below lower case characters.

After adjustments are made, retighten the adjusting screw lock nuts securely.

6. *Type Change Key (Figure 16)*

The type change keylever, located on the left side of the keyboard, must raise the anvil high enough above the front cover to allow easy installation and removal of type fonts. In the raised position, however, the anvil must still engage the anvil locating pin. The amount of anvil lift is controlled by the length of the type change keylever stroke. The lever bottoms on the type change keylever adjusting screw in the same manner as the cap and fig shift keylevers. To raise or lower the anvil, loosen the type change keylever adjusting screw lock nut and accordingly back out or turn in the adjusting screw. Retighten the lock nut after each adjustment.

The type change keylever lock is operated automatically by a tension spring each time the lever is operated, thereby holding the anvil in the raised position. The type change key lock must be adjusted so that the lock lever will easily slip under the lock without any more clearance between the lock lever and lock than is necessary to assure unrestricted operation.

A tension spring attached between the rear of the type change keylever and the machine frame holds the lever in unoperated position when the anvil is raised and rotated manually. To check its operation, raise the anvil and rotate it one-quarter of a turn so that it is held in the raised position by the locating pin. Depress and release the type change key. If the keylever does not return to unoperated position, check that it is not binding in the outer comb or on the lift lever shaft. If the tension spring is weak or damaged, replace it with a new one.

On older machines, a torsion spring coiled around the type change keylever shaft performs the same function as the tension spring described in the previous paragraph. This spring is adjusted by forming the ends to increase tension and achieve proper keylever return action.

7. *Line Guides (Figure 4)*

The baseline of printed characters should lie on the top edge of the line guides. To test, type a series of lower case "n's", move the carriage so that the left line guide is below the characters and press the paper against the guide from behind. If the characters are above or below the top edge of the line guide, adjustment is made by forming the line guide mounting bracket to align the top edge of the guide with the baseline.

The right line guide is tested and adjusted in the same manner.

Viewed from above, the forward edge of the left and right line guides must be parallel with the small feed rolls and as close to the feed roll opening as possible without overlapping it. To adjust, loosen the line guide mounting bracket mounting screws and reposition the guides. Retighten the mounting screws to hold the adjustment and then recheck the baseline alignment.

8. *Parallel Shield (Figure 9)*

The parallel shield machanism must position the ribbon shield in front of the character to be printed so that when the hammer is in operating position, the hammer face is centered in the shield opening.

a. In rest position, the shield should be far enough away from the anvil so that the type does not rub on the shield. The shield should be parallel to the small feed rolls (viewed from top of machine). In the printing position, the shield frame should hold the ribbon shield in light contact with the type font. To adjust, loosen the nuts holding the shield frame to the journal shaft arms and reposition the shield frame. Either side can be adjusted independently of the other side.

If the type font rubs on the right shield frame adjusting screw, loosen the mounting screws in both journal shaft brackets and move the shield frame assembly forward. The journal shaft arms should be as close as possible

to, but not touching, the small feed rolls. After moving the assembly, re-center the shield frame.

If moving the assembly forward does not give sufficient clearance and the type font still rubs on the adjusting screw, remove some of the washers from the screw on the inside of the shield frame.

b. To reposition the shield frame horizontally, loosen the set screw in the collar on the right end of the journal shaft and move the frame to the desired position. If moving the shield frame to the left causes the journal shaft actuating lever to rub on the left journal shaft bracket, loosen the screw in the actuating lever collar and move the lever to the right. When adjusting the horizontal position of the shield frame, clearance must be maintained between the shield frame arms and the anvil to permit type font movement.

The collar on the right end of the journal shaft is held by a bracket to prevent excessive side play. There should be approximately .005" clearance between the collar and the bracket. Form the bracket with a pair of pliers to obtain the proper clearance.

c. To reposition the shield frame vertically, loosen the set screw in the collar of the journal shaft actuating lever on the left end of the journal shaft and raise or lower the frame so that the shield opening is aligned with the hammer face when the hammer is in operating position.

When adjusting a spring actuated shield mechanism, first loosen the shield frame stop mounting screw, move the stop out of the way, and then position the shield using the left journal shaft collar so that the shield opening is slightly higher than the hammer face, then adjust the shield frame stop so that it stops the shield frame in the proper vertical position.

d. The shield actuating lever, which is mounted on the hammer shaft, must be positioned so that it clears the top of the trip frame on the forward stroke of the hammer, and does not contact the center slide on the return stroke. Adjustment is made by repositioning the actuating lever on the hammer shaft. The lever is held by two set screws which are accessible through the hole in the bottom of the trip frame. Loosen the screws and reposition the lever. Retighten the set screws after each adjustment. *(Note:* After repositioning the actuating lever, check Adjustment 8c for proper vertical alignment.)

e. To operate properly, the shield frame mechanism must be free of binds. To test, remove the spring clip which attaches the shield connecting link to the shield lift lever and journal shaft actuating lever. With the journal shaft actuating lever free of the link and lift lever, raise the shield frame manually. When released, it should drop back freely. If a bind exsists, check all adjustments. Also, check that the journal shaft brackets are parallel to each other and not twisted so as to bind the shaft.

9. *Touch*

a. *Keylevers* (Figure 1)

(1) The keylevers must be free in the inner and outer combs. If a keylever binds, it may be because of burrs on the keylever or that it is twisted. Remove the lever from the machine (Removal Procedure No. 7 a, b) and smooth it with a piece of fine emery cloth, and straighten it.

(2) The keylevers must pivot freely on the fulcrum bar. If the lever binds on the fulcrum, remove it from the machine. Check the pivot point for burrs and lubricate the fulcrum. If this does not relieve the bind, place the lever on a type block or similar metal block and strike the keylever gently directly above the pivot point to spread it slightly.

b. *Fulcrum Bar* (Figure 1)

(1) The fulcrum bar acts as the pivot point for the keylevers. The fulcrum bar must be parallel to the plane of the machine so as to hold the keylevers flush with the top of the inner comb. This can be checked visually. On DS machines it will necessary to remove the coder. Adjustment is made by shimming between the fulcrum bar and frame to raise the fulcrum or removing stock from the fulcrum pads to lower it.

(2) Wear of the fulcrum pivot points will affect the touch timing of the individual keylevers. When wear reaches the point where proper timing cannot be obtained, the fulcrum bar must be replaced. To reduce the amount of wear, the pivot points should be kept lubricated.

c. *Driver Levers and Shafts, and Return Springs* (Figure 1)

(1) In unoperated position, the driver levers rest on the driver lever adjusting screws. There should be some clearance between the driver levers and the keylevers. This clearance should not exceed 1/32".

To adjust, loosen the lock nut on the adjusting screw (Figure 65-4) and turn the screw clockwise to raise the lever; counterclockwise to lower it. After adjusting, retighten the lock nut.

(2) The driver levers should rotate freely on the driver lever shafts without side play. To test for freeness, remove the anvil and shuttle arm (Removal Procedure No. 2). Unhook the driver lever return spring from the driver lever, push the driver arm toward the feed rolls, and release it. The driver lever should return unhesitatingly to the unoperated position.

Adjustment is made by turning the shafts in or out. Loosen the shaft lock screws or lock nuts and turn the shafts clockwise to reduce side play; counterclockwise to relieve binding. After adjusting, retighten the lock screws or nuts. *(Note:* After making this adjustment, check Adjustment 9d (1), Driver Arms.)

(3) The driver lever return springs should have 3½ ounces of tension. To test, remove the anvil and the shuttle arm (Removal Procedure No. 2). Hook the ounce scale 09-0132-0 over the driver arm and pull slowly towards the rear of the machine. The driver lever should start to move when the scale reads 3½ ounces.

The driver lever spring tension is controlled by adjusting screws through the machine frame. The adjusting screw lock nuts are held in slots in the bottom of the casting (Figure 65-5). To increase spring tension, pull the screw until the nut is free of the slot and turn the nut clockwise. To decrease tension, turn the nut counterclockwise. After the adjustment is completed, make sure the lock nut is in the slot.

d. *Driver Arms* (Figure 4)

(1) In unoperated position, the driver arms should just rest against the sides of the shuttle arm cam and hold the shuttle arm so that the shuttle arm pin is centered in relation to the hammer face. To test, lightly operate a keylever on the left, then the right side of the keyboard so that the driver arm moves away from the unoperated position but does not rotate the shuttle arm. When the driver arm moves away from the shuttle arm cam, the shuttle arm should remain stationary. Also, when both driver arms are unoperated, there should be no clearance between the cam sides and the driver arms. *(Note:* These requirements are extremely important in forms ruling operation where the rule and leader line segment is located in the center of the type. See Adjustment No. 43h, Forms Type Segment Centering.)

To adjust, determine which driver arm must be moved (it may be necessary to move both arms) and the direction in which it must be moved. Loosen the driver arm brace lock nut (Figure 3-3) on the side of the driver arm which corresponds to the direction in which the arm must be moved and tighten the nut on the opposite side of the arm.

(2) The vertical position of the driver arms must be parallel to each other. To test for parallelism, depress the "q" (No. 1) keylever, hold the shuttle arm against the index pin by hand, and release the keylever. Then actuate any keylever on the right side of the keyboard. The right driver arm should have approximately .005" free travel before it contacts the shuttle arm cam. Repeat this test using the "!" (No. 30) keylever to test the left driver arm. Also, check the "b" (No. 15) and "y" (No. 16) keylevers so that when either is fully depressed, the shuttle arm cam does not contact the driver arm on the opposite side.

To make the adjustment, loosen the top driver arm mounting screw and move the arm forward or backward. Retighten the screw securely to hold the adjustment.

e. *Index Pins* (Figure 3)

(1) The index pins must be straight and operate freely in the index head plates. A bent pin can cause improper character positioning, heavy touch, or interfere with shuttle arm movement. A bent pin that cannot be easily straightened should be replaced (Removal Procedure No. 7).

(2) Rusty pins can cause heavy touch or pre-

vent the pins from returning to unoperated position, thereby interfering with shuttle arm movement. If pins are rusty, they should be replaced.

f. *Shuttle Arm* (Figure 4)

(1) The shuttle arm must rotate freely on the anvil shaft. Clean the anvil shaft and shuttle arm hub with a cloth moistened with denatured alcohol or other suitable solvent. Remove stubborn dirt, rust, or burrs with fine steel wool. Lubricate the anvil shaft lightly with oil after cleaning.

(2) There must be sufficient clearance between the lip of the shuttle arm hub and the retaining washer (Figure 9-7) to permit unobstructed movement. If insufficient clearance at this point causes a bind, increase the clearance by filing some stock from one side of the washer. Do not file or grind the shuttle arm hub.

(3) The shuttle arm cam must move freely and smoothly. If the cam binds or feels gritty, clean and lubricate it; then check the return spring for sufficient tension. Replace the spring if damaged or weak. Replace the shuttle arm if bind or grittiness persists.

(4) Check the following items and if any of the conditions are evident, replace the shuttle arm:

(a) Shuttle arm pin bent or worn.
(b) Cam mounting rivets loose.
(c) Excessive side play in the cam.
(d) Loose shuttle arm hub.

(5) Other shuttle arm adjustments which pertain to machine spacing will be found in Adjustment No. 47.

g. *Trip Frame* (Figure 11)

(1) The trip frame must be centered so that the No. 1 and No. 30 keylevers are equidistant from the ends of the trip frame. The position of the trip frame is controlled by the trip frame pivot screws which are located in the machine casting directly below the wayrod. To reposition the frame, use wrench 09-0147-0 to loosen the pivot screw lock nut on the side toward which the trip frame is to be moved and back out the pivot screw; then retighten the lock nut. Loosen the pivot screw lock nut on the opposite side and turn in the screw. Retighten the lock nut. If the trip frame must be moved a substantial amount, do not attempt to make the adjustment with one continuous turn of the screw as this may cause the trip frame to fall off the pivot screw. All trip frame side play, short of creating a bind, must be removed when making this adjustment.

(2) The height of the trip frame is determined by a headless adjusting screw through the trip frame check. The height should be set so that the trip frame rests slightly above the keylevers in the unoperated position and does not interfere with the return of the escapement lever to the unoperated position. To make the adjustment, remove the spring clip holding the suppressor link to the hammer spring adjusting bar and move the link aside, then loosen the adjusting screw lock nut and turn the screw clockwise to raise the trip frame or counterclockwise to lower it.

h. *Touch Timing*

After completing basic adjustments 9a through 9g, the touch timing must be checked. The timing should be such, for all keylevers, that the escapement releases just before the shuttle camming action is completed. If the escapement releases after the camming action is completed, the touch will be heavy; if it releases too soon, the touch will be light.

(1) If the entire keyboard is light or heavy, adjustment is made with the overall adjusting screw in the rear of the trip frame. To adjust, loosen the overall adjusting screw lock nut and turn the adjusting screw in to release the escapement sooner thus lightening the touch; turn the screw out to slow down the escapement release and make the touch heavier. Retighten the lock nut to hold the adjustment.

(2) If the keylevers on one side of the keyboard are all heavy or light, the touch can be evened by adjusting the driver arm on that side. To adjust, loosen the driver arm mounting screw and move the arm toward the keyboard to make the touch lighter or toward the feed rolls to make it heavier. Tighten the mounting screws and adjust the driver lever to reposition the driver arm parallel with the other driver arm. Upon completion of the adjustment, the driver arms must be parallel and the driver levers must clear the keylevers by no more than 1/32". To obtain both requirements, it may be necessary to adjust both driver arms

and then readjust the overall adjusting screw (See Adjustment 9h (1)).

(3) If the touch of an individual keylever is light or heavy, that keylever can be adjusted without affecting any of the other keylevers. Before adjusting individual keylevers, check the fulcrum pivot points for wear (See Adjustment 9b(2)). To adjust, first remove the keylever from the machine. If the touch is light, bend the tip of the keylever down to retard the escapement release. Place the tip of the keylever on a type block (or other steel block) and strike the shank of the lever just before the tip (Figure 63). If the touch is heavy, place the shank on the block and strike the tip (Figure 64) to bend it up to advance the escapement release.

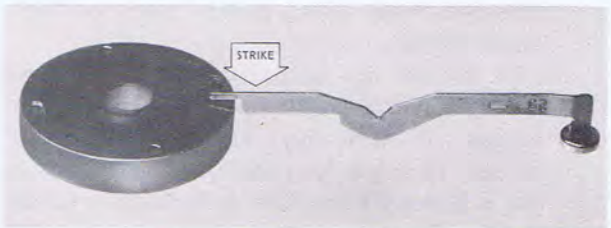


FIGURE 63 Adjustment of Light Keylever

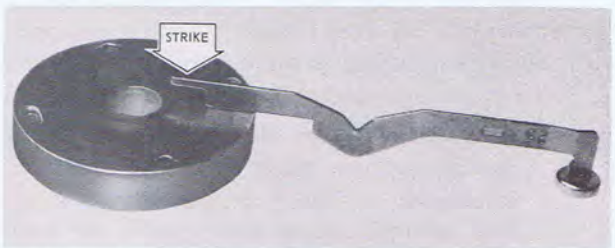


FIGURE 64 Adjustment of Heavy Keylever

In making the keylever adjustment, do not use a heavy hammer blow, as the keylever tips are hardened and will break if abused. Also, do not twist the lever or raise burrs on its edges as this will cause it to bind in the comb.

10. Space Bar

a. The flat on the index head front mounting screw spacer between the index head and index head casting must be positioned so that the flat faces, and is parallel to, the side of the space bar lever (Figure 1). In any other position, the spacer will interfere with the operation of the space bar. To adjust, loosen the mounting screw and position the spacer. Retighten the mounting screw.

b. The space hook must have adaquate side play between the driver lever shaft brackets to insure unrestricted rotation on the driver lever shafts. Adjustment is made by forming the space hook.

The space hook return spring must hold the space hook away from the hammer tail until the space bar is actuated. Insufficient return spring tension will cause the space hook to interfere with hammer operation at times other than during space bar operation resulting in poor or no character impression. Replace the return spring if it is weak or damaged.

c. A worn or broken hammer cover plate (Figure 11), or one which has sharp edges, will cause the space bar to stick in its operated position, thereby preventing the hammer from returning to rest position. Stone or replace the cover plate to correct the condition. The plate should be kept lubricated.

11. Ribbon Feed (Figures 13 and 21)

a. On machines with only a carbon ribbon mechanism, the horizontal ribbon feed shaft is held by retaining collars in one position – to operate the ribbon feed mechanism. There should be a minimum amount of clearance between the collars and the machine frame.

On machines with a fabric ribbon attachment, the horizontal ribbon feed shaft must operate in two lateral positions – in the right position to operate the left fabric ribbon spool; in the left position to operate the right fabric ribbon spool and the carbon ribbon mechanism.

Two detents (grooves) in the left end of the shaft and a steel ball and compression spring housed in the left machine frame shaft support (Figure 65-6) maintain the shaft in either of the two lateral positions. When the position of the shaft is changed either manually or mechanically, the ball is forced up and out of one detent and into the other detent. The compression spring must be strong enough to hold the ball in the detent with enough pressure to keep the shaft from moving out of position during normal operation. When it is necessary to change the shaft's position, such as during ribbon reverse operation, the pressure must not be so great as to interfere with smooth transition.

The spring may, through normal use, lose some

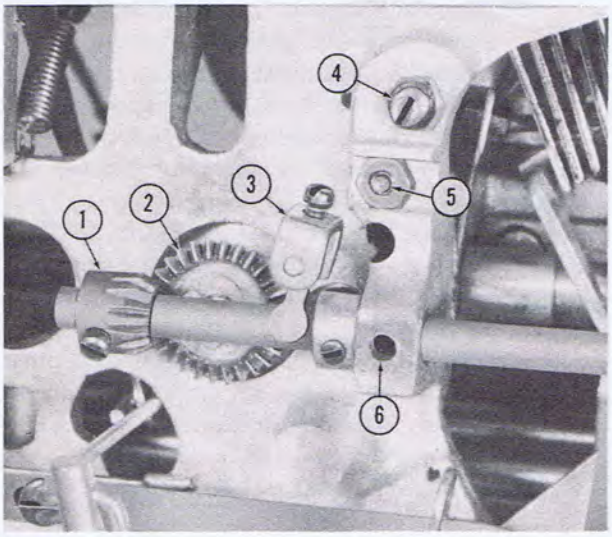


FIGURE 65
1–Horizontal Gear 2–Vertical Gear 3–Ribbon Reverse Lever 4–Driver Lever Height Adjusting Screw 5–Driver Lever Tension Spring Adjusting Screw 6–Detent Ball and Spring Access Hole

of its compression, thereby relieving pressure on the steel ball and allowing the shaft to change position when the change is not wanted. This condition can be corrected by replacing the worn spring with a new one. To make the replacment; loosen the set screws on all the collars and gears on the horizontal ribbon feed shaft. Draw the shaft out towards the right until the left end of the shaft clears the left shaft support. Draw the shaft out slowly being careful not to lose the steel ball and spring as they fall out of the machine frame. After the new spring is installed, insert the ball and hold it in position with a punch or similar tool while the shaft is being slid back into position. Before repositioning the collars and gears, move the shaft back and forth and listen for a positive click as the ball transfers from one detent to the other. If the action feels and sounds satisfactory, reposition the collars and gears on the shaft and retighten the set screws securely. The collars are positioned so as to limit the shaft travel from one detent to the other only. There must be a minimum amount of clearance between the collars and the frame.

b. The ribbon feed pawl is mounted on a stud attached to the hammer stop arm. The pawl must rotate freely on the stud. If the pawl binds, remove the lock nut and stud and lift out the pawl. Clean and lubricate the pawl and stud and replace them in the machine.

c. A tension spring between the hammer stop arm and the ribbon feed pawl holds the pawl in contact with the ribbon feed ratchet. If the spring is damaged or weak, the pawl will not engage the ratchet, thereby preventing ribbon feed. If this occurs, replace the spring with a new one. If the spring tension is too great, the pawl may be held too tightly against the ratchet and interfere with the forward movement of the hammer. Stretch the spring to reduce tension.

d. The ribbon feed pawl must rotate the ribbon feed ratchet three or four teeth each time the hammer is actuated. If the ratchet does not rotate the required number of teeth, the amount of ribbon fed will be insufficient to insure complete character coverage. This is especially important when using carbon paper or Vari-Clear ribbons.

To correct the condition, check the pawl spring to insure that the pawl is engaging the ratchet. If necessary, replace the spring. Rotate the ribbon feed shaft by hand to insure that it is not binding. Check the hammer stroke and length settings (See Adjustment No. 13f, g). Check the pawl for wear. A worn pawl could slip off the ratchet rather than rotate it. If the pawl is worn, replace it with a new one.

e. When using carbon paper or Vari-Clear ribbons, the following adjustments apply:

(1) The carbon ribbon feed gear on the horizontal ribbon shaft extension must be positioned so that it engages the gear on the vertical ribbon shaft when the horizontal shaft is pushed in. There must be a slight amount of play between the gears to prevent binds. The gear is secured to the shaft extension by a set screw. Loosen the screw and reposition the gear. The vertical shaft must be positioned so that there is a slight amount of clearance between the vertical and horizontal shafts. To adjust, loosen the set screws in the collars on the vertical shaft and reposition the shaft. The vertical gear compression spring must hold the gear in contact with the carbon ribbon feed gear. To adjust, loosen the gear set screw and reposition it on the shaft.

(2) The vertical ribbon feed shaft must rotate freely. If it binds, make sure the shaft and the shaft bracket are not bent. Reposition

the upper collar on the shaft so that there is some end play.

(3) The vertical ribbon feed shaft must be perpendicular to the horizontal shaft. Adjust by loosening the vertical shaft bracket mounting screws and repositioning the bracket.

(4) The carbon ribbon feed tension roller is held in contact with the carbon ribbon feed drive roller by a tension spring on the underside of the bracket. This spring must hold the rollers together firmly. If the ribbon slips in the rollers, and there is no apparent bind in the ribbon spool or anywhere in the ribbon path, it is an indication that the tension spring is weak. Strengthen it or install a new spring to correct the condition.

(5) The contact surfaces of the tension roller and drive roller must be parallel to each other. If there is more pressure at the top, the ribbon will work its way out of the rollers; if there is more pressure at the bottom, the ribbon will be forced down and possibly work its way under one of the rollers. Adjust for equal pressure by forming the tension roller bracket.

f. When using fabric ribbon, the following adjustments apply:

(1) The left and right ribbon cup shafts, universals, and gears must rotate freely with a slight amount of end play. To adjust for end play in the shaft, reposition the collar on the ribbon cup shaft. If there is a bind, check all parts for dirt, lubrication and wear. Make any necessary part replacements after cleaning and lubricating fail to relieve the bind.

(2) The universal shaft gear must be positioned so that there is a slight amount of clearance between the universal shaft and the horizontal shaft. The universal shaft gear compression spring must hold the gear in contact with the horizontal shaft gear. To adjust, loosen the gear set screw and reposition it on the universal shaft. Only one universal shaft gear must be engaged by a gear on the horizontal shaft at any given time. Adjustment is made by properly positioning the gears on the horizontal ribbon feed shaft.

(3) The ribbon reverse arms are actuated by a metal eyelet near both ends of the ribbon. As the eyelet rotates the reverse arm, the reverse mechanism (Figure 65) must change the position of the horizontal ribbon feed shaft so that the gear on the empty ribbon cup shaft is engaged by the gear on the horizontal shaft. The lever on the end of the reverse arm contacts a collar on the horizontal shaft and moves the shaft. Adjustment is made by repositioning the lever on the reverse arm.

On earlier machines, the trip lever on the reverse arm contacts the ribbon reverse gear on the horizontal shaft. This action prevents the shaft from rotating and forces it to the other detent position. Adjustment is made by repositioning the reversing gears on the horizontal shaft.

The reversing gears should be as close as possible to the trip levers to insure proper reversing action. However, if the gears are set to close to the trip levers, the levers will jam in the gears and lock up the machine. The trip levers are held in unoperated position by torsion springs on the trip lever connecting links. These springs must draw the trip levers away from the gears and back to unoperated position when the reversing action is completed. Insufficient return spring tension should be corrected by replacing weak or damaged springs.

g. The ribbon feed ratchet stop engages the ribbon feed ratchet and allows it to rotate in only one direction. The stop must be positioned so that it engages the ratchet at all times. Adjustment is made by loosening the ratchet stop mounting screw and moving the stop to the proper position.

12. Motor Box (Figures 10 and 66)

a. The motor box supplies the actuating spring tension to return the hammer to rest position. It should rewind after approximately every 19th stroke of the hammer in order to maintain sufficient tension to perform this function. If the motor box fails to rewind, check the following items:

(1) Make sure the machine connecting cord is plugged into the electrical outlet and that current is reaching the machine.

(2) See if the motor box switch is closed. If it is not, close it manually. If the motor box rewinds, it is an indication that the cam lever is not operating the switch.

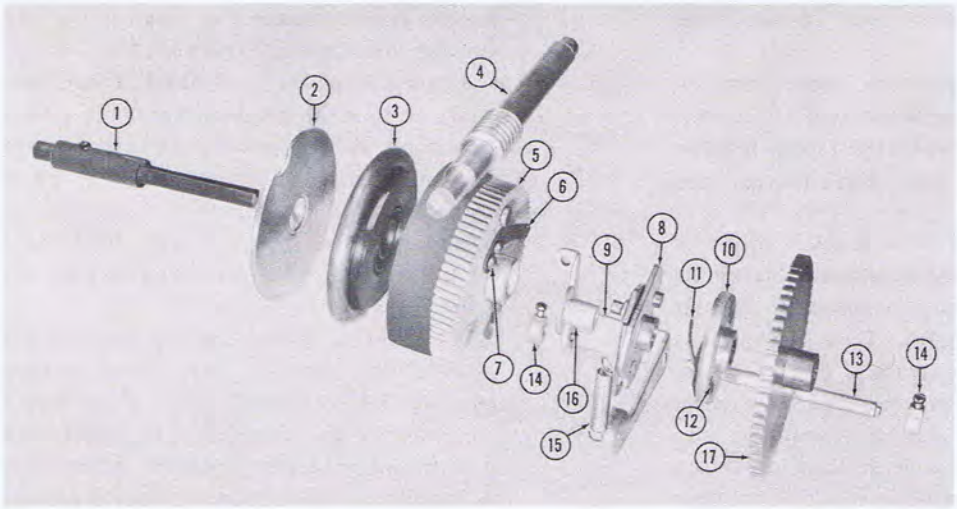


FIGURE 66
1—Spring Barrel Shaft
2—Cover
3—Spring Band
4—Worm
5—Spring Barrel
6—Trip Spring
7—Rivet
8—Motor Box Cam
9—Cam Lever (Motor Box Switch Actuator)
10—Adjusting Spacer
11—Spacer Spring
12—Rivet
13—Cam Lever Shaft
14—Shaft Retaining Collar
15—Cam Lever Spring
16—Cam Hub
17—Motor Box Gear

Rotate the switch on its mounting bracket or form the switch actuating leaf spring as outlined in Adjustment No. 12c.

(3) If the motor box switch is closed and the motor box still does not rewind, there may be a break in the circuit. Check all wires and connections and check the switch to be sure it is not defective.

(4) Check the motor by turning the motor shaft (clockwise) manually while the switch is closed. If the motor operates after turning the shaft, this is an indication that the motor has a dead spot and should be replaced.

(5) Check the motor box main spring tension (Adjustment No. 12b). The spring may be overwound preventing further rewinding. Reduce the spring tension.

(6) Check the mesh of the spring barrel and motor box worm. If they are to tightly meshed, a bind will exist preventing the motor from operating. To eliminate the bind, loosen the four motor box rear plate mounting screws and push the plate down as far as possible. Retighten the mounting screws.

(7) Check for a slight amount of end play on the motor box shaft. If there is no end play, drive the motor box gear or spacer farther down on the shaft.

b. The motor box main spring should have sufficient tension immediately prior to rewinding to return the hammer to unoperated position at maximum impression setting. To test, raise the escapement rack so that it is clear of the gear sleeve; hook the pound scale 09-0131-0 under the hammer eccentric screw and lift up slowly. The scale should read 2 to 3 pounds just as the hammer begins to move.

To increase tension, operate the motor box switch manually and hold it closed for one full revolution of the motor box cam. Check the tension and repeat the operation if necessary.

To decrease tension, disconnect the machine connecting cord from the electrical outlet and operate a keylever until the motor box locks up. With a screwdriver, press down the motor box cam lever to release the cam and operate a keylever until the motor box locks up again. Plug in the connecting cord and check the tension. Repeat the operation until the proper tension is obtained. *(Note:* Tension in excess of 3 pounds should be avoided if possible.)

c. On approximately every 19th stroke, the motor box cam releases the cam lever. The cam lever must close the normally open motor box switch. If the switch remains open, rotate it on its mounting bracket or form the switch actuating leaf spring.

d. If the motor box main spring is disconnected or broken, the spring barrel will rotate when the switch is closed, but will not rewind the spring. The spring must be rehooked or, if broken, replaced.

Remove the motor box from the machine (Removal Procedure No. 110) and remove the spring barrel assembly. Rehook or replace the spring.

e. The trip springs on the motor box gear (motor box spacer (DS)) are held by two soft rivets. These springs operate the motor box cam and excessive strain on the motor box could

cause one of the rivets to shear off. If a rivet is sheared, the spring may slip and wedge itself between the gear (spacer (DS)) and the cam lever, thereby preventing motor box operation. If this occurs, use the following procedure to correct the condition:

(1) Work the spring back into position or pry the other rivet loose and work the spring out of the motor box.
(2) Remove all tension from the motor box. To insure all tension has been relieved, lift the carriage escapement rack clear of the escapement gear sleeve and reduce the tension until the hammer fails to return to rest position.
(3) Remove the motor box (Removal Procedure No. 110).
(4) Remove the motor box rear plate and lift the gear (spacer (DS)) from the motor box shaft.
(5) Install a new spring and rivets.
(6) Reassemble and replace the motor box. Make sure that all parts are free of binds.

13. Hammer

a. *Hammer Pivots*

The hammer must rotate freely on the hammer pivot screws (Figure 5-10) with no side play. The pivot screws are located directly below the wayrod and above the trip frame pivot screws. Use wrench 09-0147-0 to loosen the pivot screw lock nuts and tighten or loosen the screws as required. Always retighten the lock nuts before checking the hammer for proper side play adjustment.

b. *Hammer Centering*

The hammer must be centered in relation to the characters on the type font. To test, remove the ribbon shield, anvil, shuttle arm (Removal Procedure No. 2), and idle pin and bracket (Removal Procedure No. 5b, c) and install the hammer centering gauge 09-0152-0 in the anvil bushing. Depress the "b" (No. 15) and "y" (No. 16) keys to allow the two index pins to enter and hold the gauge in place. Hold the hammer back manually and further depress either key to trip the hammer, then allow the hammer to come forward slowly while the depressed key is held in operated position. If properly centered, the hammer will enter the opening in the gauge. If the hammer does not enter the gauge freely, the hammer is off center.

To make the adjustment, loosen the pivot screw lock nut on the side toward which the hammer must be moved. Back out the pivot screw, then retighten the lock nut. Loosen the pivot screw lock nut on the opposite side and turn the screw in. Retighten the lock nut and check again with the gauge. If necessary, repeat the procedure until the hammer is perfectly centered. If the hammer must be moved a substantial amount, do not attempt to make the adjustment with one continuous turn of the screw as this may cause the hammer to fall off the pivot screws. After the adjustment is completed, make sure the hammer is free and that there is no side play.

c. *Hammer Weight*

The hammer actuating spring tension should be checked at the maximum impression control setting. Fully depress a key and hold it in its operated position. Hook the ounce scale 09-0132-0 under the hammer face and pull back the scale. Just as the hammer starts to move, the scale should read 8½ ounces. To adjust, use the adjusting screw in the hammer spring adjusting bar (Figure 12-3) on the underside of the machine. Loosen the lock nut and turn the screw in to increase tension or out to decrease tension.

Machines equipped with a spring actuated shield frame require less spring tension – 7¼ ounces. This is because the shield frame mechanism is operated by its own actuating spring instead of by the hammer.

d. *Escapement Wheel Drop*

The escapement actuating lever blade enters the escapement wheel a fraction of a second before the escapement pawl releases the escapement wheel. As the pawl releases, the wheel should rotate a few thousandths of an inch before engaging the actuating lever blade. This small amount of movement is escapement wheel drop. If there is no drop, the lever must force itself into the wheel and will cause the touch to be heavy. If there is too much drop, the escapement wheel (and carriage) may still be moving when the hammer strikes the type resulting in blurred copy.

To test for escapement wheel drop, hold the hammer back manually as a key is fully depressed. When the escapement pawl releases the wheel, the wheel should rotate slightly before engaging the escapement actuating lever blade.

Adjustment is made by raising or lowering

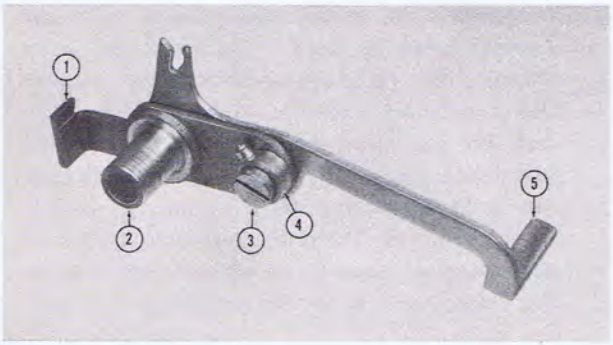


FIGURE 67 ESCAPEMENT LEVER
1–Blade 2–Hub 3–Lock Screw 4–Eccentric 5–Tail

the drop adjustment screw (Figure 5-5) in the hammer adjusting bracket. The adjustment is made from the underside of the machine. The screw and lock nut are accessible through a hole in the repeat key bracket. However, the repeat key trip lever must be moved to get at the adjusting screw. Use wrench 09-0125-0 to loosen the lock nut, then turn the screw clockwise to increase the drop; counterclockwise to decrease it. Retighten the lock nut.

e. *Escapement Actuating Lever (Pin Drop)*

The escapement actuating lever blade must enter the escapement wheel a sufficient distance to prevent skipping and to insure that when the lever disengages itself from the wheel the time required for disengagement will be adequate for the escapement pawl to be properly positioned to re-engage the wheel. This distance is called pin drop and is the measured distance that the shuttle arm travels between the time the key is released and the escapement actuating lever blade disengages the escapement wheel.

To check pin drop, depress the "a" (No. 2) or the "½" (No. 29) key. Release the key slowly and count the number of index pins the shuttle arm tail passes over before the actuating lever blade releases the escapement wheel. There should be only sufficient pin drop to insure that the carriage does not skip. Normally this will be about ½ to 1 pin.

Pin drop is adjusted by means of the eccentric on the escapement actuating lever (Figure 67-4). Loosen the eccentric lock screw and turn the eccentric to the right (viewed from the rear) to increase pin drop; to the left to decrease it. Tighten the lock screw after each adjustment.

f. *Hammer Stroke*

Hammer stroke is the distance between the hammer face and the anvil when the hammer is in unoperated position (Figure 68). This distance should be set to the width of the hammer gauge 09-0139-0.

The hammer stroke is controlled by the hammer eccentric screw in the escapement mechanism. The dog on the end of the screw engages the hammer swivel in the rear of the hammer. As the screw is rotated (during adjustment), the dog moves the swivel and thus moves the hammer forward or backward.

To adjust the stroke, loosen the eccentric screw lock nut and turn the screw. The eccentric screw dog should be kept to the right (viewed from the rear). Tighten the lock nut, then check the adjustment again to insure that tightening the lock nut did not disturb the adjustment.

g. *Hammer Length*

Hammer length is the clearance between the hammer face and the anvil when the hammer is in operating or printing position (Figure 69). This distance should be set to the thickness of the hammer gauge 09-0139-0.

To test the hammer length, move the impression lever to the setting where the hammer weight registers 5 to 5½ ounces. Remove the ribbon shield, depress a key to bring the hammer into printing position and hold it there. The hammer gauge should fit snugly

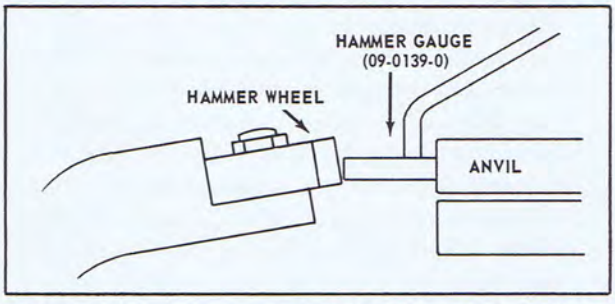


FIGURE 68 SETTING HAMMER STROKE

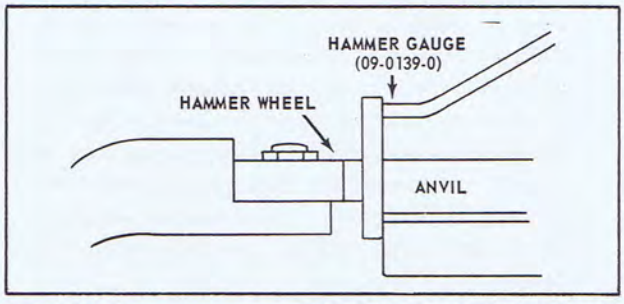


FIGURE 69 SETTING HAMMER LENGTH

when inserted between the hammer face and the anvil without moving the hammer.

To make the adjustment, loosen the lock screw in the hammer stop nut and turn the nut clockwise to increase clearance; counterclockwise to decrease it. Recheck the adjustment after retightening the lock screw.

h. *Fall Back*

Fall back is the clearance between the escapement wheel pawl and the next tooth on the escapement wheel when the hammer is in operating or printing position. Only enough clearance is necessary to insure that the pawl enters the wheel without contacting the tooth. Normally this condition will automatically be achieved if escapement wheel drop, hammer stroke, and hammer length are set correctly.

To test, depress a key to bring the hammer into printing position. Hold the hammer forward manually and release the keylever. There should be a slight clockwise rotation (viewed from the rear) of the escapement wheel.

To adjust, check the escapement wheel drop, hammer stroke, and hammer length settings and readjust if necessary. If the settings are correct and there is still no fall back, reduce the stroke only enough to give the required fall back.

14. Hammer Face Resurfacing (Figure 70)

The VariTyper Hammer Face Resurfacer is set and thoroughly tested before leaving the factory. Service Representatives are cautioned against attempting to adjust the unit because of the lack of re-alignment facilities in the field. Should any signs of misalignment of the unit, or wear of the grindstone become evident, return the resurfacer to the factory for adjustment or part replacement.

Use the following procedure to resurface a worn or damaged hammer face:

a. Remove the front and back covers, paper table, (Removal Procedure No. 52), anvil and shuttle arm (Removal Procedure No. 2), idle pin and bracket (Removal Procedure No. 5b, c), and ribbon shield.

b. Check the hammer centering with the hammer centering gauge. Make certain the hammer shaft rotates freely on the hammer pivot screws with a minimum of side play.

c. Unlock and back off the hammer stop nut until it is free of the repeat key bracket or Forms Attachment suppressor block.

d. Insert the hammer face resurfacer in the index head casting. Make sure the resurfacer's Off-On switch is in the "Off" position, then plug the connecting cord into an electrical outlet. Raise and insert the No. 1 and No. 30 index pins into the resurfacer's base plate indexing holes. Both pins must remain in the index head bottom plate to position the resurfacer properly. Paper clips or other suitable devices inserted between the bottom plate and the pins' spring retainer will keep the pins in position during grinding.

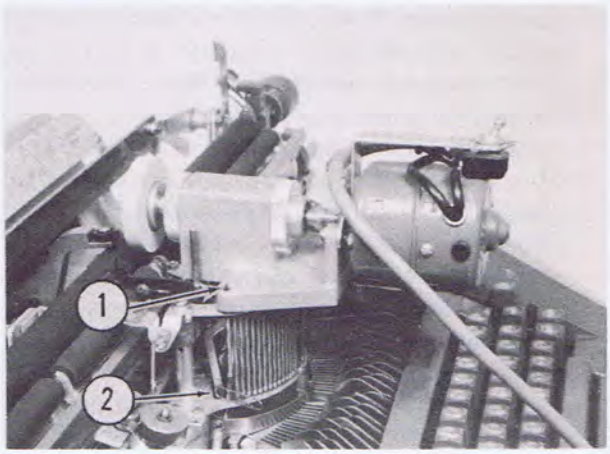


FIGURE 70 HAMMER FACE RESURFACER
1–Index Pin in Base Plate Locating Hole 2–Paper Clip

e. Set the impression lever at minimum impression setting.

f. Release the hammer escapement and retain it in its released position by inserting a screw driver between the escapement lever and the escapement lever actuating screw in the trip frame. Manually hold back the hammer to prevent it from striking the grindstone.

g. Move the resurfacer switch to "On".

h. Allow the hammer to move toward the grindstone slowly until contact is made. Continue to hold the hammer to prevent it from vibrating. Do not press the hammer against the stone – the pressure supplied by the hammer actuating spring is sufficient for the grinding operation.

To prevent the hammer face from overheating and causing possible breakdown of its hardness qualities, grinding must be done intermittently – that is, hold the hammer face to the grindstone for only a few seconds, then withdraw it. After the first few contacts, examine the hammer face to determine how much grinding will be necessary. A piece of white paper held beneath the hammer face will reflect from the polished surface where resurfacing has

taken place. If the entire surface is evenly bright, resurfacing is complete. If dull spots or patterns from previous grindings are visible, additional grinding is necessary.

Slowly raising the resurfacer a short distance, then lowering it to its rest position by means of a shift key while grinding will prolong the grindstone's life by retarding the development of a groove in its grinding surface. *(Note:* The resurfacer can be used in only the lower case or cap shift positions. Do not use it in the fig shift position as the height of the grindstone in this shift position will be above the bottom edge of the hammer face.)

i. Remove the hammer face resurfacer from the index head and reassemble the machine.

15. *Repeat Key (Figure 5)*

a. The repeat trip lever should be positioned approximately 1/32" above the repeat latch when the hammer is in the operated position. Adjustment is made by forming the latch up or down to get the desired clearance.

b. The repeat latch should be parallel to the plane of the machine when the hammer is in operated position. To adjust, loosen the hammer eccentric screw lock nut and reposition the latch.

c. The repeat trip lever should return the hammer to as near unoperated position as possible before releasing it. Adjustment is made by forming the tail of the lever. Move the tail away from the repeat lever shaft (Figure 22-15) to pull the hammer farther back. If the tail is too far from the shaft, the trip will not release the hammer. If this occurs, form the tail so that it contacts the shaft sooner.

d. When the repeat key is released, the repeat trip lever return spring should return the lever to rest position. If it does not, check the mechanism for binds and a weak or damaged return spring.

16. *Suppressor (Figure 13)*

The hammer blow is suppressed when the comma, period and hyphen are typed to avoid excessive embossment of the imaging material and premature deterioration of these characters on the type font.

a. The following items should be checked to insure that proper suppression is being applied:
(1) Check the suppressor spring to insure that it is properly hooked between the suppressor and the hammer tail.
(2) Make sure the suppressor arm is being properly positioned above the rear (viewed from the underside) of the suppressor by the suppressor links. The suppressor arm must be positioned before the hammer releases and must not bottom on the suppressor shift plate. Adjustment is made by reforming the bend in the link; however, extreme care should be exercised as the links are brass and subject to breakage. Each suppressed keylever must be adjusted individually.

b. Suppression at minimum impression setting is adjusted by repositioning the suppressor plate. To make the adjustment, loosen the suppressor plate mounting screws and move the plate toward the front of the machine to increase suppression; toward the rear of the machine to decrease it.

c. Suppression at maximum impression setting is adjusted with the suppressor link. To make the adjustment, loosen the lock nut on the shoulder screw which connects the link to the shift arm and move the link to the right to increase suppression; to the left to decrease it. Retighten the lock nut to hold the adjustment. *(Note:* Adjustments 16b and 16c are interrelated. If one is changed, the other must be checked.)

17. *Spacing Shift Assembly (Figure 34)*

a. The rack lift lever must raise the carriage escapement rack high enough to allow the largest spacing gear on the gear sleeve to clear the carriage rack when changing horizontal spacing. In rest position, the lift lever must clear the rack.

The rack lift actuating lever controls the rack lift lever. Adjustment is made by changing the starting position of the actuating lever. Move the carriage to the extreme left. Loosen the set screws in the hub of the actuating lever and rotate the lever on spacing shift shaft to the desired position. Retighten the set screws securely to hold the adjustment.

b. The gear sleeve must be positioned so that the gear which corresponds to the spacing selected on the indicator plate is the only gear engaging the carriage escapement rack. Adjustment is made by forming the shift lever extension. If forming the shift lever extension does not provide sufficient adjustment, re-

position the spacing shift lever on the shift shaft.

c. The gear sleeve is positioned on the escapement shaft by the escapement shift fork. The prongs of the fork must be smooth and properly aligned to avoid a bind, and as close to the gear sleeve as possible without interfering with its rotation. Proper alignment, in which the prongs are parallel to each other and not twisted, can be achieved by forming the prongs. If the prong tips are badly worn or sprung, the fork should be replaced.

d. The shift lever lock is mounted on the spacing shift shaft and its purpose is to assure that horizontal spacing cannot be changed unless the justifier mechanism is in unoperated position. The lock must be positioned so that when the shift lever extension is operated, the lock clears the center slide when the justifier mechanism is in unoperated position (dial pointer on "N"), and will engage the center slide when the justifier mechanism is in operating position (dial pointer off "N").

To position the lock so that it is perpendicular to the horizontal plane of the center slide, loosen the set screws in the spacing shift lever and rack lift actuating lever and rotate the spacing shift shaft. Retighten the set screws, then check Adjustment No. 17a.

To position the lock so that the center slide clears the lock teeth in all spacings, loosen the mounting screw which secures the lock to the shift shaft and move it to the left or to the right as required to obtain proper clearance.

18. Back Space and Half Back Space (Figures 15 and 22)

(*Note:* The back spacer must be set correctly before the half back spacer can be checked.)

a. The back space pawl must engage the full depth of the back space ratchet tooth with only a slight amount of sliding motion. Adjustment is made with the back space lever and pawl stop adjusting screw. Loosen the adjusting screw lock nut and turn the screw clockwise to reduce the amount of slide, or counterclockwise to increase it. Tighten the lock nut after adjusting.

b. In the rest position, the clearance between the back space pawl and the back space ratchet teeth should not exceed 1/32". To adjust the clearance, loosen the set screws securing the back space front lever to the back space rod and rotate the rod. Tighten the front lever set screws after adjusting and recheck Adjustment 18a.

c. Operation of the back space keylever should move the carriage back one space plus a little overthrow to insure proper escapement wheel shaft pawl engagement. The amount of back space movement is determined by the length of the stroke of the back space keylever. To increase back space movement, it is necessary to increase the stroke length. To make the the adjustment, loosen the back space stop screw lock nut on the underside of the machine with wrench 09-0125-0 and turn the stop screw counterclockwise. To shorten the stroke and decrease back space movement, turn the screw clockwise. Tighten the lock nut after each adjustment. When making the adjustment, be sure the keylever is bottoming on the adjusting screw and not the frame stop mounting screw. If the keylever does contact the mounting screw, remove some stock from the half back space keylever.

d. To test half back space operation, type a lower case "l"; depress the half back space keylever and hold it in its operated position and type a second "l"; release the half back space key and type a third "l". The three "l's" should be equally spaced. If the middle "l" is to far to the left, loosen the half back space frame stop mounting screw and move the stop up. If the middle "l" is to far to the right, move the frame stop down. Tighten the mounting screw securely after each adjustment and test again.

19. Carriage

The carriage is moved by tension stored in the carriage spring barrel (Figure 12-4) and is secured to the wayrod by steady brackets and to the index head by the carriage front guide. It must have unrestricted freedom along its entire course of travel with minimum play at the points of support.

a. The wayrod (Figure 27-6) must be straight and square to the machine. If the wayrod is bowed, loosen the wayrod mounting screws and allow the wayrod to seat itself. If this does not correct the condition, reposition or shim the wayrod supports. If the wayrod is bent or so badly nicked that it cannot be smoothed by filing, it must be replaced.

b. There should be a minimum of clearance between the wayrod and the carriage steady brackets (Figure 24-1). Adjustment is made by

removing the carriage steady brackets (Removal Procedure No. 60) from the carriage and forming them.

c. All carriage ball bearing rollers (Figure 24-2) must be free. Roller binds are usually caused by lack of lubrication. If lubrication fails to eliminate the bind, remove the roller (Removal Procedure No. 61) and install a new one.

d. The carriage front guide (Figure 9-2) is attached to the top of the index head by two screws and two pins and holds the carriage perpendicular to the horizontal plane of the machine. The position of the front guide is set at the time of manufacture and should not be changed. If the front guide is removed for any reason, it should be returned to the same position.

There should be only enough clearance between the front guide rollers and the tie rod to assure free movement of the carriage. If insufficient clearance causes a bind, or excessive clearance causes too much play, loosen the front guide eccentric lock nut and turn the eccentric to add or remove clearance. Retighten the lock nut to hold the adjustment.

e. The carriage spring barrel tension varies according to the length of the carriage. Following are the recommended spring barrel tensions for different carriage lengths and models:

Models 519, 565, 582, 584, 595	1 3/4 - 2 lbs
Models 110, 116	2 - 2¼ lbs
Models 610, 660, 681, 695	2½ - 2 3/4 lbs
All 20" Carriages	2½ - 2 3/4 lbs
All 24" Carriages and Model 330	3 - 3¼ lbs

To weigh the carriage tension, move the carriage to the extreme left and disengage the carriage escapement rack from the gear sleeve. Use string or a paper clip to keep the rack disengaged during the weighing process. Hook the pound scale 09-0131-0 to some part on the right side of the carriage, such as the carriage end, and pull slowly towards the right. Check the reading on the scale just as the carriage starts to move.

To increase carriage tension, re-engage the carriage escapement rack and gear sleeve and move the carriage to the extreme right. Disconnect the carriage band from the spring barrel and rotate the spring barrel clockwise one full turn. To reduce tension, allow the spring barrel to turn counterclockwise one full turn. Reconnect the carriage band and check the weight again. *(Note:* While the carriage band is being disconnected, hold the spring barrel firmly (with a rag if the fingers or barrel are greasy) to prevent it from spinning out of control, thereby releasing all of its tension.)

f. When the carriage release levers (Figure 23-2) are operated, they move the carriage release rod (Figure 27-18) forward, which in turn operates the carriage release assembly allowing the carriage to be shifted. If the carriage fails to release, check the tabulator mechanism to be sure it is adjusted properly (See Adjustment No. 20). If the tabulator is set correctly, check to see if the release lever is bottoming on the wayrod. Correct this by forming the end of the carriage release lever up, and then check the tabulator basic function. For machines with two release levers, both must be checked to see that there is no interference from the other.

g. The carriage release lever return springs which are located in the hub of both carriage return levers must have sufficient tension to return the release levers to their rest positions when they are released. To adjust tension, loosen the screw holding the outer plate to the release lever stud and rotate the plate toward the rear of the machine. Normally about ¼ turn is sufficient. Retighten the screw to maintain tension.

h. The margin rack (Figure 27-2) is located on the front of the carriage and is held by three shoulder screws. The rack must move freely when the margin rack adjusting stud thumb nut is rotated. If the rack binds, remove the shoulder screws and check for dirt or rust. Make sure the surface of the carriage behind the rack is also clean. Reassemble and check.

20. Tabulator (Figure 22)

a. The distance between the push rod lock nut and the hub of the escapement wheel shaft should be approximately ¼". To adjust, loosen the limit screw lock nut and turn the screw clockwise to decrease travel distance or counterclockwise to increase it.

b. The vertical arm of the release lever and bracket must clear the carriage release rod by a few thousandths of an inch. Minor adjustments can be made by means of the limit screw. Turn the screw clockwise to increase

clearance; counterclockwise to decrease it.

This adjustment will affect Adjustment 20a and should not be made if the correction requires more than a half turn of the adjusting screw. If more extensive corrections are needed, they should be made by forming the tip of the vertical arm where it contacts the carriage release rod.

c. The push rod should have approximately 3/64" travel before the escapement wheel shaft pawl begins to release the gear sleeve. The pawl must clear the ratchet teeth inside the gear sleeve when the push rod is in fully operated position. Adjustment is made by changing the starting position of the push rod. If the escapement wheel shaft pawl is releasing too soon, loosen the push rod lock nut and turn the push rod out of the escapement wheel shaft (counterclockwise when viewed from the rear) and into the push rod head. If the pawl does not clear the ratchet teeth when the push rod is fully operated, turn the rod into the escapement wheel shaft (clockwise). Although it is not necessary, removal of the motor box will facilitate making this adjustment.

d. The front actuating lever in the tabulator bracket transfers motion from the tabulator keylever to the release lever and bracket. The actuating lever must have a small amount of free motion between the keylever and the release lever and bracket. Adjustment is made by forming the left tip of the actuating lever up to increase free motion; down to decrease it. *(Note:* Adjustments 20a, b, c, and d are interrelated. If one is changed, the others should be checked.)

e. In unoperated position, there must be 1/32" clearance between the tabulator reed and tabulator stops. To adjust this clearance, form the right end of the rear actuating lever down to decrease clearance; up to increase it.

f. The tabulator reed must be in position to engage the tabulator stop just before the carriage releases. To adjust, reform the front actuating lever (See Adjustment 20d).

g. There are times in tabular composition when the tabulator key is operated and a tabulator stop is positioned directly below the reed. When this occurs, the reed spring stretches and allows the rear lever to move to operated position while the reed rests on the stop. When the carriage starts to move, the stop is removed from under the reed. It is the reed spring's function to quickly snap the reed down and position it in front of the next stop. This action must be very fast, especially if the stop is set only a few spaces beyond the previous stop.

In order to assure that this action will not be restricted in any way, the reed must be prefectly free where it is joined to the rear actuating lever by the shoulder screw and lock nut. Also, the reed spring must have sufficient tension to snap the reed down. Remove any binds at the shoulder screw connection by forming the rear lever so that it is parallel to the reed.

If there is no bind but the action is still sluggish, the reed spring may be weak or damaged and should be replaced with a new one.

21. Feed Rolls

a. The large and small feed rolls must be parallel to each other when the feed rolls are closed. Parallelism is achieved by repositioning the large feed roll in the right feed roll hanger. This adjustment is made when the large or small feed rolls are replaced, or when normal small feed roll adjustments do not suffice.

Before the large feed roll can be paralleled, it is necessary to remove any adjustments on the small feed rolls. Back out all the small feed roll bearing adjusting screws (Figure 27-19) until the screw heads are flush with the surface of the tie rod. (Do not allow any of the screws to extend beyond the surface of the tie rod as they will interfere with the carriage front guide rollers when moving the carriage.) Loosen all the feed roll bearing mounting screws and pull back all the bearings until they are in contact with the tie rod, then retighten the mounting screws. Make sure the small feed rolls rotate freely in the bearings and the tie rod mounting screws are securely tightened (See Adjustment No. 21b).

When all adjustment has been removed from the small feed rolls, insert a one-inch wide strip of paper in one end of the feed rolls and close the rolls, Disengage the Linomatic or the variable line spacer, hold the feed roll knob to keep the large feed roll from turning, and pull the strip of paper out of the feed rolls. Insert the strip in the opposite end of the feed rolls and repeat the test. The amount of pull required to slip the strip of paper out of the

feed rolls must be equal at both ends. To equalize this pressure, the pressure at the right side is increased or decreased.

To make the adjustment, loosen the large feed roll bearing mounting screws on the right feed roll hanger. Loosen the feed roll setter screw lock nut and back out the screw (Figure 23-4) to decrease pressure; turn it in to increase pressure. Retighten the lock nut and bearing mounting screws. *(Note:* With the feed rolls closed, the large feed roll bearing mounting screws are not completely accessable. In order to tighten these screws securely, it is necessary to open the feed rolls. However, in doing this, the bearing may move away from the tip of the setter screw and lose the adjustment. Therefore, before tightening the mounting screws, make certain the bearing and setter screw are in contact by applying pressure manually to the feed roll shaft or to the bearing in the direction of the setter screw and maintain this pressure while tightening the screws.)

b. The small feed rolls must rotate freely in their bearings with a slight amount (1/64") of end play. End play is adjusted by repositioning the collars on the inner small feed roll shafts. The bearings should be lubricated with a minute amount of light oil. Extreme care should be taken that oil does not get on the rubber of the feed roll. If it does, clean it immediately with solvent.

c. The small feed roll pressures are adjusted by turning the feed roll bearing adjusting screws in (clockwise) to increase pressure; by backing the screws out (counterclockwise) to decrease pressure. To check this pressure, insert a one-inch wide strip of paper in the feed rolls and close the feed rolls. Disengage the Linomatic or the variable line spacer, hold the feed roll knob to prevent the large feed roll from rotating, and pull up the strip noting the pull required to slip the paper out of the feed rolls. Check the pressure at both ends of the feed rolls first. Adjust the end bearings (match one end to the other – usually the lighter pressure side brought up to the heavier side) so that the pressure at both ends is equal. Next, test the middle bearing points of both small feed rolls. This pressure should be equalized between the two points, but must be slightly less than the end pressure. Then, check the pressure at the center bearing points. The pressure at these points should also be equalized, but must be slightly less than the middle pressure. When properly adjusted, the feed roll pressure will be equal at opposite points, and gradually lessen slightly from the ends toward the center. When adjusting the small feed roll bearings, the feed rolls should be open and the small feed roll bearing mounting screws loosened.

While making the adjustments, the small feed rolls should be checked constantly for free operation in the bearings. If a bind does exist, it is usually caused by one of the bearing adjusting screws having been turned more than the other. This causes the bearing to be slightly cocked in one direction. Binds are eliminated by re-adjusting the bearing so that it is parallel to the tie rod.

When feed roll pressure at one of the bearing points must be relieved, the bearing may not follow the adjusting screws. If such is the case, the bearing mounting screws should be loosened and the bearing pulled back manually. Make sure all bearing mounting screws are securely tightened after the feed rolls are adjusted.

To test the adjustment, insert a sheet of paper in the machine and type four or five lines of "x's" across the sheet evenly spaced from the top of the bottom of the sheet. Remove the paper and fold it in half so that the ends of top line are super-imposed. The ends of the other lines must also be superimposed. If they are not, re-adjust the feed roll pressure. The low side of the line of "x's" indicates the side with the lesser amount of pressure.

d. There must be some clearance between the feed roll opener (Figure 23-1) and the shoulder screw roller when the feed rolls are closed. Lack of clearance at this point will hold the right end of the large feed roll back and interfere with proper parallel contact with the small feed rolls. If only a slight amount of clearance is needed, this condition may be corrected by removing the feed roll opener (Removal Procedure No. 72) and grinding or stoning a slight amount of stock from the opener detent. Care must be exercised to avoid weakening the feed roll opener. If sufficient clearance cannot be obtained by grinding the feed roll opener detent, advance the small feed rolls equally until the clearance requirement is met and then re-adjust the feed roll pressures.

e. After continued use without proper cleaning, the feed rolls will become glazed and cause the paper to slip as it is fed. This condition can sometimes be corrected by removing the glaze with a piece of fine emery cloth, steel wool or solvent dampened cloth. Rub lightly and evenly along the entire length of the feed roll and at the same time rotate the feed roll slowly. Continue the operation until the glaze has been removed.

After the glaze has been removed, clean the feed rolls and carriage parts thoroughly with a cloth dampened with solvent.

22. *Variable Line Spacer (Figures 27 and 28)*

a. The line feed lever must rotate freely on the lever mounting screw. If the lever binds, check the lever swivel to make sure it is free in the lever. Also check the lever mounting screw and the lever to make sure they are clean and free from burrs. The lever return spring must have sufficient tension to return the lever to rest position.

The lever mounting screw is eccentric and must be set so that the lever is free in all five settings of the line feed regulator. To adjust, loosen the mounting screw lock and turn the screw to the desired position. Retighten the lock to maintain the adjustment.

b. The feed roll ratchet pawl actuates the large feed roll ratchet and must engage the proper tooth in order to give the line spacing for which the regulator was set. In the first regulator setting, the pawl should rotate the ratchet two teeth; in the second setting, three teeth and so on to the last setting in which the ratchet must be rotated six teeth. If the pawl does not engage the proper ratchet tooth, the number of teeth rotated in any of the five settings may be one more or less than called for by the setting.

The rest or starting position of the pawl is controlled by the pawl stop hook. To make the adjustment, loosen the stop hook lock nut and turn the hook down to retard engagement (if an extra ratchet tooth is being picked up); turn the hook up to advance engagement (if the pawl is by-passing the first ratchet tooth). Retighten the lock nut to maintain the adjustment.

In its rest position, there must be some clearance between the pawl and ratchet teeth. Insufficient clearance will cause the pawl to engage the ratchet when the feed roll is rotated manually. Adjust the stop hook down slightly to obtain clearance.

c. The feed roll ratchet spring is mounted on the feed roll hanger shaft and must be positioned so that the spring will rest between two ratchet teeth when the feed lever is in fully operated position. To adjust, loosen the ratchet spring mounting screw, operate the feed lever and hold it in fully operated position, then move the spring so that the roller is properly positioned. Hold the spring in this position and release the lever, then tighten the mounting screw.

The tension with which the ratchet spring engages the ratchet can be increased or decreased by forming the spring near the mounting end. The spring tension should be strong enough so that when the feed roll is rotated manually, the clicks will be clearly audible.

d. The variable spacer assembly on the left end of the large feed roll is controlled by the variable spacer push rod. With the rod pushed in, the feed roll and the ratchet must turn as one unit with no slippage. When the rod is pulled out, the feed roll must be independent of the ratchet.

In order to adjust the variable spacer assembly to meet these requirements, it is necessary to remove the large feed roll from the carriage assembly (Removal Procedure No. 76).

If the feed roll and ratchet do not turn as a unit when the push rod is pushed in, the feed roll ratchet lock nut must be tightened against the friction washer. Hold the nut with wrench 09-0130-0 while loosening the ratchet with wrench 09-0136-0. Turn the lock nut on the variable spacer flange ½ turn toward the friction washer, then tighten the ratchet against the lock nut. Test the adjustment by holding the feed roll steady while attempting to rotate the ratchet manually. It should require considerable pressure to force the ratchet to rotate. When the push rod is pulled out, only a slight amount of pressure should be necessary to rotate the ratchet. If necessary, repeat the adjustment procedure until the requirements are met.

If the feed roll and ratchet rotate as a unit when the push rod is pulled out. Follow the same procedure outlined above except that the ratchet and lock nut must be turned away from the friction washer.

When the assembly is properly adjusted, the push rod, when pushed in, should travel approximately ¼" before meeting resistance, such resistance being the engagement of the variable spacer pawls by the tip of the push rod.

23. *VariLine Attachment (Figure 30)*

a. The VariLine Attachment bushing must be positioned on the feed roll shaft so that when the VariLine gear is installed on the bushing, the gear will be aligned with the center of the detent spring. Loosen the bushing mounting screws and position the bushing on the feed roll shaft to meet the requirement.

b. The position of the VariLine detent spring holder must be adjusted so that when the detent spring lift lever is in horizontal position, the detent spring will just clear the gear. Loosen the holder mounting screw and, with the lift lever in the horizontal position, position the holder to meet this requirement. Retighten the holder mounting screw.

c. The detent spring must be straight in the holder and not cocked to either side to assure that the full width of the gear tooth will be engaged by the blade of the spring. Loosen the spring and spring stiffener mounting screw and position the spring.

24. *Justifier (Figures 31 and 32)*

Usually, the majority of malfunctions which are attributed to the mechanical operation of the justifier mechanism are actually caused by improper operational settings. It is, therefore, important that all operational settings are checked before any adjustments are made to the mechanism. If the operational settings are correct, use the following procedure to check out the justifier.

a. The dial pointer should be as close to the dial as possible without rubbing on it. To adjust, loosen the dial pointer mounting screws and reposition on the shaft. Retighten the mounting screws.

b. The dial pointer shaft must be perfectly free in the shaft bracket with a minimum of end play. Shaft binds usually occur when the two bracket shaft holes are not aligned, or one end of the bracket is twisted. This condition can be corrected by forming the bracket to obtain alignment. The amount of end play can be adjusted by repositioning the upper collar on the shaft.

c. The dial pointer gear segment (Figure 71-1) must be aligned with the gear segment rack on the center slide, and must be properly meshed so that the first tooth of the rack rests between the first and second tooth of the gear segment. Mesh and alignment can be adjusted by loosening the set screws in the positioning collars and the dial pointer and moving the shaft clear of the rack. The segment can be rotated to its proper position, then re-engaged with the rack. Position the lower collar so that the segment is aligned with the rack, then retighten the positioning collar set screws to hold the adjustment. Reposition the upper collar and dial pointer and tighten the set screws. Mesh can also be adjusted by loosening the gear segment rack guide mounting screw and raising the rack clear of the gear segment. The segment is then repositioned and the rack re-engaged. Retighten the rack guide mounting screw.

d. The center slide, to which the gear segment rack is attached, must be prefectly free on its mounting shoulder screws. Improper center slide operation can be caused by loose mounting screws, or a bend in the slide itself. Improper adjustment of the shift lever lock can also interfere with center slide operation (See Adjustment 17d). If neither the mounting screws nor the shift lever lock are causing the bind, the slide may be bent. If the slide cannot be straightened while in the machine, re-

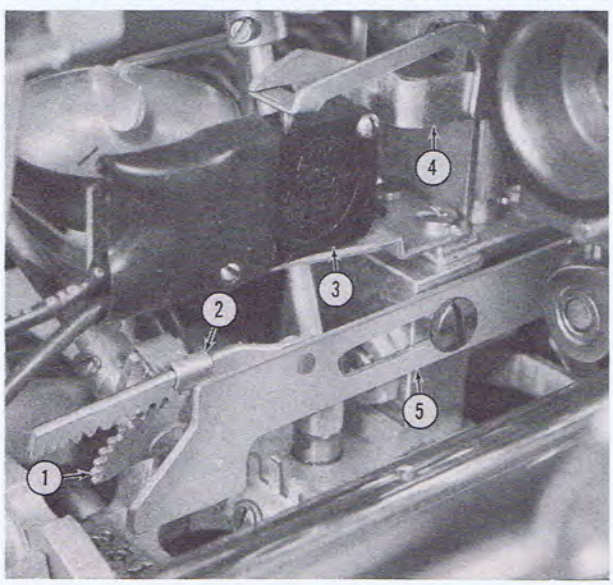


FIGURE 71

1—Justifier Dial Shaft Gear Segment 2—Justifier Rack Guide 3—Forms Attachment Cutoff Switch 4—Forms Attachment Cutoff Switch Bracket and Lever 5—Center Slide

move it and form it, or replace it if necessary (Removal Procedure No. 83).

Another area in which improper center slide operation can occur is where the sine shift shaft actuating lever joins the center slide to the sine shift shaft. The actuating lever must be in line with the center slide, or undue stress will be placed on the slide causing a bind.

e. To test the sine shift shaft for binds, detach the sine shift shaft actuating lever link from the center slide by removing the spring clip, raise the sine bar, and rotate the shaft manually. If the shaft is not perfectly free, check the retaining collar on the shaft to be sure it is not binding against the machine casting. Position the collar to obtain free operation with a minimum of end play. If the collar is free of the casting and the shaft is still binding, loosen the set screws in the retaining collar and actuating lever, remove the actuating lever pin and remove the shaft. Check for burrs, clean and lubricate the shaft. then replace it in the machine.

f. To test the sine bar for binds, set the dial pointer at "N", then raise the sine bar manually to horizontal position and allow it to drop. The bar must drop freely. If it does not, check the justifier ratchet assembly to insure that it is not rubbing on the justifier selector plate. If it is rubbing, adjust the retaining collar on the sine shift shaft to allow a little more end play. Check the sine bar guide to see if it is bent. Adjust by forming the guide. Make sure the sine pawl release lever is fully disengaging the pawl from the ratchet.

g. The sine ratchet pawl must rotate freely on its shaft and the pawl spring must pull it into the ratchet as the dial pointer moves to the left. If it fails to engage the ratchet, remove the pawl (Removal Procedure No. 127) and check the pawl and the shaft for burrs. Clean and lubricate the shaft and replace the pawl. If the pawl still does not engage the ratchet, check the pawl spring. If it is weak or damaged, strengthen or replace it with a new one.

h. When the horizontal spacing is changed, the pawl shifter lever moves the sine ratchet pawl along the pawl shaft and positions the pawl over the ratchet which corresponds to the horizontal spacing setting. The pawl must be aligned with the desired ratchet without overlapping the adjacent ratchets. Adjustment is made by forming the pawl shifter lever; maintaining, as much as possible, the arc in the tip of the lever.

i. With the dial pointer to the extreme right, the sine shift shaft lever should be stopped just far enough away from the sine ratchet pawl shaft to allow the pawl to slide by when shifting into 10 spacing. Also, when the carriage is banked, the tip of the lever must fully disengage the pawl from the ratchet. Adjustment is made by rotating the sine shift shaft or forming the shaft lever.

j. The sine shift shaft lever adjusting screw is positioned so that it insures that the sine ratchet pawl will make the last step on the ratchet with a slight amount of overthrow. To adjust, loosen the adjusting screw lock nut and turn the screw in to increase the throw of the ratchet; turn the screw out to decrease the overthrow. Retighten the lock nut to hold the adjustment.

k. The justifier dial indicates the range within which the unjustified line must be terminated. It is calibrated in letter spaces to show the minimum (first graduation on right end of scale) line length which can be stretched to the predetermined column width and the maximum line length (zero) which is the predetermined column width. The graduations between these two points indicate the number of character spaces left before reaching the maximum length.

Mechanically, each graduation represents a tooth on the justifier ratchet. The justifier dial pointer must, therefore, be set so that it will accurately indicate the position of the ratchet tooth through observation of the justifier dial. To test, set the machine at 16 spacing, then move the dial pointer slowly to the left and listen for the click as the ratchet pawl falls into the first tooth on the ratchet. As the click sounds, the left edge of the dial pointer should be positioned over the graduation to the right of 9. To adjust, loosen the two dial pointer hub set screws and move the pointer in the appropriate direction to obtain correct timing. Retighten the set screws and test the adjustment.

l. After the rough (unjustified) line is typed, the tabulator key is operated to bring the carriage to the justifying area in preperation for the second (justified) typing. Since it is the removable mangin stop which operates the center

slide which, in turn, sets up the justifier mechanism, it is necessary to disengage the slide from the stop before the carriage starts to move. The margin release rod performs this function by drawing down the center slide, thereby allowing the stop to pass over the slide without interference. To test the function, set the removable margin stop at 8 and operate the space bar until the dial pointer moves into about the center of the justifying range. Depress the tabulator key slowly. The carriage should move to the left while the dial pointer remains stationary. If the release rod is improperly set, it will not draw the center slide down far enough or fast enough. This will result in movement of the dial pointer toward zero when the carriage tabulates. To adjust, loosen the release rod lock nut and turn the adjusting nut clockwise to advance the release action; counterclockwise to retard it. The release rod must have a little end play when the dial pointer is at the extreme ends of the dial. Retighten the lock nut to hold the adjustment.

m. The actuating bar, justifier bell cranks, and carriage must be free of binds. To test, move the carriage to the extreme left. Position the justifier selector assembly (trolley) on the actuating bar so that the actuating bar will drop to its lowest point. Raise the bar manually, then release it. The carriage should move freely when the bar is raised and released. If it does not, check all parts and assemblies involved in the action for binds. Some of the areas to check carefully are: actuating bar and bell crank pivot points, carriage escapement rack guide rod, carriage front guide, carriage steady brackets, and carriage spring barrel tension.

n. To insure proper justification, the horizontal track must be perfectly parallel to the horizontal plane of the machine frame. If the track is higher or lower at the pivot point than at the opposite end, the justified line will be, accordingly, shorter or longer than the predetermined column width for which the justifier was set.

To test, set the horizontal spacing shift lever at 10 spacing and position the justifier selector assembly so that it is riding on the track. Type 31 lower case "l's". The length of the line from the first to the last "l" should be exactly 3 inches. If the line is long, loosen the horizontal track adjusting screw lock nut on the underside of the left end of the column rack and back out the adjusting screw. If the line is short, turn in the adjusting screw. Retighten the lock nut and repeat the test.

On some machines, there may be no horizontal track adjusting screw. To make the adjustment, remove the pins from the column rack bracket above and to the left of the motor box (viewed from the rear) and loosen the bracket mounting screws. If the line is long, move the rack down; if the line is short, raise the rack. When the adjustment is completed, drill and repin the column rack to the column rack bracket.

o. When the justifier dial pointer is at zero, the sine bar must be horizontally aligned with the horizontal track. To test, set the horizontal spacing shift lever at 10 spacing. Move the dial pointer to zero. Position the justifier selector pointer so that it is riding on the horizontal track and type a line of 30 lower case "l's". Return the carriage and line up under the first "l". Position the justifier selector so that it is riding on the sine bar and type another line of 30 "l's". Both lines should be the same length. If the second line is longer than the first, the sine bar is low; if the second line is shorter than the first, the sine bar is high. (Note: Before adjusting the sine bar, check the horizontal track, Adjustment 24n.)

To adjust the sine bar, loosen the two sine bar lifting link lock screws and the sine bar adjusting screw lock nut and turn the adjusting screw clockwise if the line is long; counterclockwise if the line is short. Retighten the lock nut and lock screws and test the adjustment.

p. When the sine bar is horizontally aligned with the horizontal track (zero on the justifier dial), no additional space will be added to the second or justified typing since the horizontal alignment indicates that the line being typed is a full line and does not require justification. (See Adjustment 24o.) When the sine bar is not horizontally aligned with the horizontal track, it indicates that the line being typed is short and requires extra space to stretch it to the predetermined column width. The shorter the line, the more critical the angle of the sine bar. The amount of stretch, therefore, depends on the degree of the angle at which the sine bar is resting.

The angle of the sine bar is controlled by the sine bar ratchet of the particular horizontal spacing being used and each step of the ratchet will set the sine bar at a different angle. The first three ratchets (10, 12, and 14 spacing) are adjustable – their positions can be changed up or down, and when changed, will affect the angle of the sine bar. The last ratchet, 16 spacing, is fixed and its position cannot be changed.

In the justification process, a maximum length line and a minimum length line, when justified, must both be the same length. Assuming that the full line is the correct length, its length will be used as a basis to determine if the remaining lines are being justified to the correct line length. If they are not, then the individual ratchet must be adjusted to correct the angle of the sine bar.

The fixed ratchet (16 spacing) can be adjusted by changing the position of the column selector scale. By changing the position of the scale, the setting position of the column selector will change and this will alter the angle of the sine bar in all ratchet positions except the last step (zero) in which the sine bar is horizontally aligned with the horizontal track.

To test the adjustment of the fixed ratchet, set the machine at 16 spacing. Set up the justifier for a 1.9 inch column width (minimum column width setting). Set the column selector pointer for the number of characters in a full line which at 16 spacing is 30, and type that number of lower case "l's" on the rough, then justified side. Return the carriage and type a second line under the first which contains 21 "l's" which is the minimum line length. The justified line of 21 "l's" should be exactly the same length as compared to the full line of 30 "l's" above it, within the allowable tolerance of the width of the stem of the "l".

If the second line (minimum length) is shorter than the first line (maximum length) it indicates that more stretch is required and to obtain more stretch, the sine bar must be lowered. Loosen the column selector thumb screw and move the selector so that the column selector pointer is slightly to the left of the column selector scale setting. Type the test lines again and, if necessary, move the column selector slightly more to the left. Test the setting after each adjustment.

If the minimum line is longer than the maximum line, less stretch is required. Raise the sine bar by moving the column selector to the right of the column selector scale setting.

When the correct column selector position has been achieved, and both lines are justifying to the same length, the column selector scale must be moved so that the scale setting graduation mark (in this case, the 30 graduation mark on the 16 character per inch scale) is aligned with the column selector pointer.

To make the adjustment, loosen the nuts on the column selector scale mounting screws and move the scale to the correct position. Retighten the mounting screw nuts.

After the fixed ratchet has been tested and, if necessary, adjusted, the three movable ratchets can be tested. Do not adjust the movable ratchets until it is determined that the fixed ratchet is properly adjusted.

The right (viewed from the rear) ratchet screw holes are elongated to permit the ratchet to be moved up or down, thereby changing the angle of the sine bar. To test the position of the movable ratchets, use the same procedure used to test the fixed ratchet, except that the justifier settings are made for 10, 12, and 14 spacings. The maximum and minimum line lengths in characters at 1.9 inch column width setting with the machine set at 10 spacing are 19 and 13 characters respectively; at 12 spacing, 23 and 16 characters; at 14 spacing, 27 and 19 characters.

If the test lines show that the minimum line is shorter than the maximum line, more stretch is required and can be obtained by lowering the sine bar. To make the adjustment, loosen the right ratchet mounting screw and move the individual ratchet down. If the minimum line is longer than the maximum line, it is an indication that less stretch is required. To reduce the amount of stretch, move the ratchet up. Retighten the mounting screw and test again.

The adjustment must be made very carefully because when the ratchet mounting screw is loosened, all three ratchets are prone to movement. When one movable ratchet is adjusted, the other two must be tested to determine if they were moved out of position.

q. When the alignment marks on the column selector pointer and the justifier selector pointer are aligned, the roller on the justifier selector pointer should be at the junction of the sine

bar and the horizontal track so that as the first character of the justified line is typed, the roller moves down the sine bar. If the roller is still on the horizontal track, the first one or two characters of the justified column will not be justified. If the roller is on the sine bar before the first character is typed, the left edge of the justified column will not be even. To adjust, loosen the two assembly screws which secure the justifier selector pointer to the justifier selector assembly and reposition the pointer.

r. The sine pawl release lever is mounted on the justifier selector plate and is actuated by the actuating bar. The purpose of the release lever is to prevent the justifier selector assembly from going under instead of riding on the sine bar when the carriage is banked. The lever must release the pawl as the actuating bar contacts it, but not before the minimum length line of a justified column is completed. To test, set the justifier mechanism for a 1.9 inch column width using any horizontal spacing setting. Type a minimum length line. After typing the justified line, the actuating bar must still be above the pawl release lever arm. Continue typing until the actuating bar is fully bottomed. At this time, the bar should contact the pawl release lever arm and release the pawl from the ratchet allowing the sine bar to drop. If the pawl releases the ratchet before the actuating bar is bottomed, form the pawl release lever down to delay the release action. If the pawl release lever does not fully disengage the pawl from the ratchet when the actuating bar is bottomed, form the arm on the release lever up to advance the release action.

s. The justifier actuating bar lock is mounted on the front of the justifier selector assembly and its purpose is to hold the actuating bar in the raised position when the justifying mechanism is not being used. Raise the actuating bar manually and slide the justifier selector to the left end of the actuating bar. The lock must rest fully on the left bell crank. If it does not, form the lock.

25. *Two-Way Linomatic (Figures 40 and 41)*

a. The vertical shaft in the Linomatic housing must rotate freely without any end play. To adjust, loosen the lock nut on top of the housing and tighten or loosen the screw bushing as required. Retighten the lock nut securely.

b. The feed roll shaft gear and Linomatic shaft gear must mesh without binding and with a minimum of lost motion. To adjust, loosen the housing mounting screws and move the assembly to the desired position.

c. The index handle must move freely in the slot in the index swivel. The index handle tension spring must hold the index handle blade in the index gear, and the blade must be as square as possible to the index gear. If the handle sticks or moves sluggishly, remove (Removal Procedure No. 67), clean, and check for burrs. If the tension spring is weak, replace it with a new spring. If the index handle is not squared to the gear it will be necessary to shim the swivel.

d. The teeth of the index gear must hold the index handle blade securely. If the gear teeth are worn, the blade may slip out of the gear and into another setting. Replace the worn gear with a new one (Removal Procedure No. 66). *(Note:* The screw holes in some index gears are positioned so that the gear can be rotated 180 degrees, thereby exposing a new set of teeth to the index handle blade.)

e. The Linomatic feed lever rotates on the index swivel hub. The feed lever must rotate freely, and when feeding forward, the feed lever return spring must return the lever to the rest position. If the lever binds, back off slightly on the screw bushing in the Linomatic cover (See Adjustment 25a). Make sure the return spring is properly positioned and has sufficient tension to return the lever. If the spring is weak or damaged, replace it with a new one.

f. The pawl shift lever on the underside of the feed lever determines which pawl engages the feed gears on the vertical shaft. The projection on the shift lever must engage the detents on the underside of the feed lever securely to insure that the lever will not slip and allow the pawl to miss the feed gear. Form the shift lever to get positive detent engagement.

g. The forward and reverse pawl tension spring must keep the active pawl in positive contact with the feed gear. If the spring fails to hold the pawl in position, install a new spring. If the pawls become worn, they may slip out of the gear while feeding. If this occurs, install new pawls (Removal Procedure No. 68a, b, c, d).

h. The detent spring mounted on the rear of the

Linomatic housing must be securely engaged with the detent gear on the vertical shaft. To adjust, set the index handle at ½ point. Move the feed lever to the right against the index swivel stop and hold it in its operated position. Loosen the detent spring mounting screw and position the spring so that the blade is centered between two teeth on the gear. Retighten the mounting screw securely to maintain the adjustment.

i. The feed lever stop on the left side of the housing must be set so that the first tooth that the forward space pawl picks up will give the correct spacing. To test, set the index handle at ½ point setting and operate the feed lever slowly. There should be one click. If there are more than one or no clicks, the stop must be adjusted to permit the handle to return farther to the left to pick up the next tooth if there are no clicks, or adjusted to shorten the lever's return if there is more than one click. To adjust, loosen the stop screw lock nut and turn the screw in to lengthen the feed lever return; turn the screw out to shorten it. There should be approximately ¼ tooth of lost motion between the tooth and the pawl as the feed lever starts to move. Retighten the lock nut securely.

j. The feed roll knob clutch must be positioned so that when the feed roll knob is tightened, the Linomatic bushing presses the worm gear against the pinned collar on the feed roll shaft, and the feed roll is rotated by the operation of the Linomatic feed lever. When the feed roll knob is loosened, the feed roll must turn freely when manually rotated. To adjust, remove the feed roll knob and tighten the bearing (screw in toward feed roll) to get more positive enagement when the knob is tightened, or loosen the bearing (screw away from the feed roll) to prevent the Linomatic from actuating the feed roll when the knob is loosened. Engagement should take place with approximately 1/8 turn of the feed roll knob.

26. *One-Way Linomatic*

a. The Linomatic gear and feed roll shaft gear must mesh with a minimum of play. To adjust, loosen the Linomatic mounting screws and reposition the entire assembly on the shaft.

b. The feed lever return spring must return the feed lever to unoperated position. If the lever fails to return, or hesitates in its travel, remove, clean and check for burrs. Make sure the return spring is properly connected. If cleaning fails to free the lever, the return spring may be weak or damaged and should be replaced with a new one.

c. The detent spring on the left side of the housing has the same requirements as the detent spring on the Two-Way Linomatic and should be adjusted in the same manner (See Adjustment No. 25h).

d. The feed lever stop screw is adjusted in the same manner as the Two-Way Linomatic (See Adjustment 25i).

27. *Coder Retainers (DS) (Figure 72)*

The removable coder is held in place by leaf springs on the sides of the coder brackets which snap over the lower lip of the coder seating it. The spring mounting screw holes are elongated to permit raising or lowering the springs to insure positive engagement of the coder.

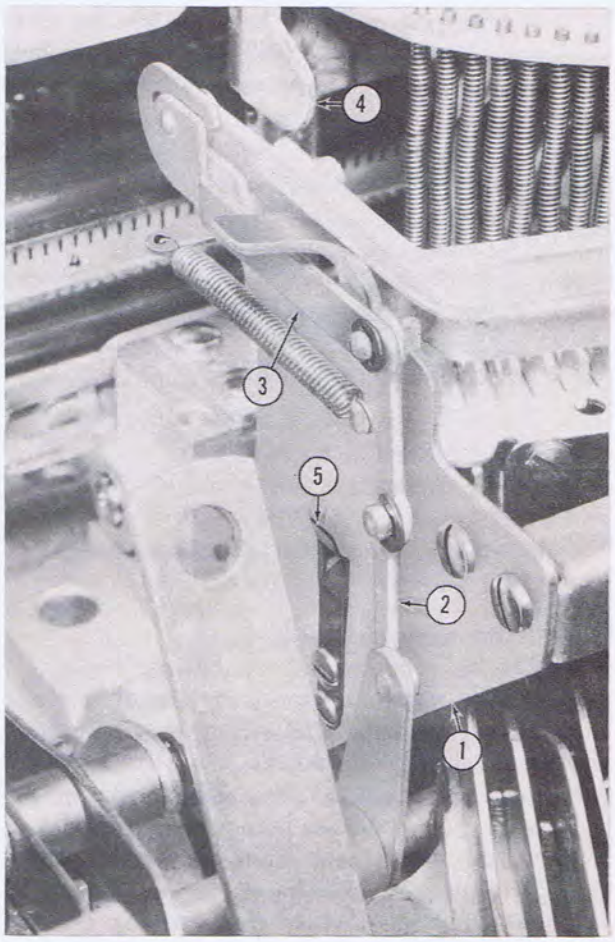


FIGURE 72

1—Coder Bracket 2—Bail Throwout Lever 3—Bail Throwout Link 4—Bail Cam 5—Coder Retaining Spring

28. *Coder (DS) (Figure 73)*

a. As a keylever is actuated, the corresponding code bar is raised. Upon releasing the key, the code bar return spring must return the bar to unoperated position. If a code bar fails to return to unoperated position, make sure it is not binding in the slot. If the code bar is binding, disconnect the code bar return spring and remove the bar. Clean it and if bent, straighten it. If the bar cannot be straightened properly, replace it with a new one. If a code bar fails to return due to insufficient return spring tension, replace the weak or damaged spring with a new one.

b. The individual code bars must be aligned with their respective keylevers. To adjust, form the lower portion of the bar.

c. The code bars must be low enough so that in unoperated position they are below the bail rest. In operated position, they must raise the bails to the proper height. If a bar is above the bail rest, remove some stock from the lower end. If a bar does not raise the bails high enough, peen the lower end.

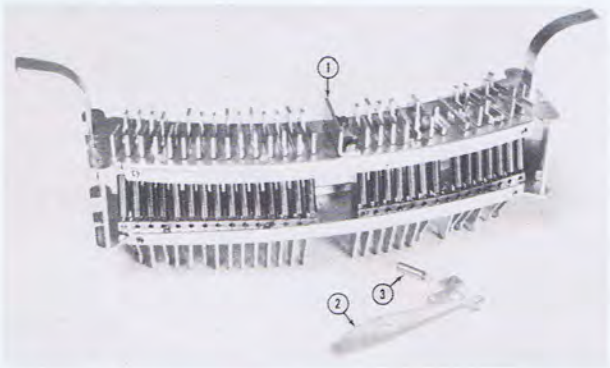


FIGURE 73
1—Bail Rest 2—Code Bar 3—Code Bar Spring

29. *Code Bar Bails (DS) (Figure 36)*

a. The code bar bails must operate freely. To test, pull out the standard shift arm and operate the bails manually. If there is a bind, remove it by forming the the code bar bails or the code bar bail brackets. In forming the bails, do not disturb their position in relation to the code bars (See Adjustment 29b).

b. The relationship between the code bar bails and the code bars is controlled by the bail throwout levers on the sides of the coder brackets. The bails must be positioned so that the two-increment character code bars raise neither bail, three-increment character code bars raise the front bail, and four-increment character code bars raise both bails. To test, make sure the anvil is bottomed, then use the "q" (No. 1) and "p" (No. 28) keylevers to check the alignment. Depress the "q" key; the front segment of the code bar should raise the front bail and the rear segment of the code bar should clear the rear bail with a minimum of clearance. To adjust, loosen the lock screw in the left bail throwout lever actuating arm, which is located on the anvil lift lever shaft, and rotate the arm forward to move the bails toward the rear of the machine; rotate the arm toward the rear of the machine to move the bail forward. Use the "p" key to check the right bail throwout lever and adjust in the same manner.

The code bar-code bar bail relationship must be checked whenever the anvil height adjustment is changed.

After the bail throwout levers have been adjusted, each keylever should be checked to insure that the code bar is properly aligned with the bails. If a single code bar operates a bail when it should clear it, check for burrs on both pieces. If both pieces are clean, file only sufficient stock from the code bar segment to obtain the required clearance. If a single code bar fails to operate a bail, replace it with a new one. If a small group of code bars is out of alignment, correction should be made by forming the bail in that particular area. Exercise care in forming the bails to prevent binds.

c. The code bar bails must be parallel to the tops of the code bars to assure uniform operation of the two and three-increment stops. If the clearance between the code bars and the bails is greater at one end, the code bars may not lift the bail sufficiently to completely remove the increment stop from the path of the flying dog. This will result in improper increment selection.

To obtain parallelism, twist the bails until the clearance between the code bars and bails is equal at both ends.

30. *Two and Three-Increment Stops (DS) (Figures 37 and 39)*

As the code bar bails are raised by the code bars, the two and three-increment bail links, which are connected to the bail lever pins, rotate the two and three-increment shafts and stops. When a two-increment character is printed, neither

shaft rotates and the tail of the flying dog should strike the two-increment stop near the center of the contact surface. The two-increment stop is secured to the two-increment shaft by means of a set screw. Adjust the stop by loosening the set screw and rotating the stop on the shaft. When a three-increment character is printed, the front bail is raised and rotates the two-increment stop down so that the flying dog bypasses the stop and strikes the three-increment stop. The three-increment stop is riveted to the end of the three-increment shaft. To adjust, loosen the set screw in the three-increment shaft lever and hub at the opposite end of the shaft and rotate the entire shaft and stop assembly to the desired position. When a four-increment character is printed, both bails are raised permitting the flying dog to bypass the two and three-increment stops and strike the flying dog stop.

The two and three-increment shafts should have a slight amount of end-play to insure free operation.

31. *Standard Shift Arm (DS) (Figure 36)*

When the standard shift arm is pulled to the right, it disengages the bails from the bail connecting links. The tail of the front bail lever engages the standard shift cam which is mounted on the coder tie plate and actuates the two-increment shaft rotating the two-increment stop down. The flying dog will, therefore, select three increments for all characters. The amount of shaft rotation is controlled by the position of the standard shift cam. If the flying dog does not clear the two-increment stop in standard position, loosen the cam mounting screw and move the cam to the left. However, caution should be exercised that the bail lever will re-engage the bail pin when the standard shift arm is returned to the DS position. If both requirements cannot be met by repositioning the standard shift cam, form or file the tapered end of the shift lever.

32. *Carriage Escapement Wheel Drop (DS)*

The carriage escapement wheel must have a slight amount of drop to allow unrestricted entry of the flying dog actuating lever blade into the escapement wheel teeth. To test, operate the actuating lever manually and look for a slight clockwise (viewed from the rear) rotation of the escapement wheel. The movement should not exceed .010". Adjustment is made by moving the flying dog stop. To increase the amount of drop, loosen the flying dog stop mounting screws and move the stop to the right. It may be necessary to loosen the anti-backlash spring mounting screw in order to move the stop to the right. To decrease drop, move the stop to the left. Retighten the mounting screws securely.

After making the drop adjustment, check the escapement wheel anti-backlash spring adjustment and readjust if necessary. (See Adjustment No. 37)

33. *Flying Dog (DS) (Figure 39)*

a. The flying dog must rotate freely in the escapement wheel slot. If it binds, it may not disengage from the escapement wheel resulting in failure to move the carriage, or on its return it may fail to immediately re-engage the wheel, thereby permitting the carriage to skip. Sluggish flying dog action will result in bad character spacing. If a bind does exist, first remove and clean the flying dog (Removal Procedure No. 111) and escapement wheel slot. If cleaning fails to eliminate the bind, carefully stone the sides and the blade of the dog with a fine, flat abrasive stone.

b. When the flying dog actuating lever is operated, the flying dog blade should disengage the escapement wheel and clear the wheel's teeth in its travel to the increment stop (the arc of the flying dog provides for this clearance.) If the dog rubs against the teeth, or engages a tooth before it reaches the increment stop, the condition can be corrected by adjusting the actuating lever (Adjustment No. 34, Flying Dog Actuating Lever). At times it may become necessary to stone the arc of the dog to rid it of burrs. Caution must be observed to avoid flattening the curve of the arc.

c. When the flying dog tail engages the increment stop, the blade should be positioned approximately 1/3 of the distance between the tooth it is to engage and the tooth to the left of it (viewed from the rear) so that when the key is released, the flying dog will engage the proper tooth of the escapement wheel. If it is positioned too closed to the tooth it must engage, it could possibly skip it and engage the next tooth, thereby adding an extra increment to the character space. If the blade is too close to the tooth to the left of the tooth it should engage, it may engage that tooth resulting in the lose of an increment. The two and three-increment stop positions are adjusted by forming the tail of the flying dog. The relative positions of the two and three-increment stops are such, that when the

flying dog is adjusted for either of the stops, it will be properly adjusted for the other. Form the tail of the flying dog away from the stop to move the blade closer to the tooth it should engage; form the tail toward the stop to move the blade farther away from the tooth. *(Note:* The flying dog is case hardened. Forming the tail must be done with care to prevent cracking. Use pliers while holding the dog securely to make the adjustment.)

The flying dog position for the four-increment stop is adjusted by forming the four-increment stop arm. Form the arm to the right (viewed from the rear) to move the blade closer to the tooth it should engage; toward the left to move the blade farther away. Do not move the stop to make this adjustment as this will affect the escapement wheel drop adjustment.

The flying dog position for the one-increment space is adjusted by moving the one-increment stop laterally on the one-increment space shaft. Move the stop to the right (viewed from the rear) to move the blade closer to the tooth it should engage; toward the left to move the blade farther away.

d. The flying dog blade and the teeth of the escapement wheel should be kept lightly greased to facilitate easy release and to minimize wear.

34. *Flying Dog Actuating Lever (DS) (Figure 39)*

The flying dog actuating lever is timed to release the flying dog when the hammer is 5/16" from the anvil (On machines below serial number 12023, the flying dog should release when the hammer is 1/8" to 3/16" from the anvil.).

Adjustment is made by means of the flying dog actuating lever timing screw. Loosen the timing screw lock nut and turn the screw in (clockwise) to move the blade closer to the escapement wheel for faster release, or turn the screw out (counter-clockwise) to move the blade farther away from the escapement wheel to retard release. This should result in the flying dog actuating lever being positioned so that there is some clearance between the upper blade and the teeth of the escapement wheel. However, in some instances, the flying dog may be released before the upper blade engages the escapement wheel allowing the wheel to skip a few teeth before engagement occurs. To correct this condition, remove the actuating lever (Removal Procedure No. 112) and peen the lower arm up slightly. If there is no clearance between the actuating lever blade and the escapement wheel, peen the lower arm down slightly.

After peening, the flying dog actuating lever timing must be reset. During the timing adjustment, a check must be made for clearance between the actuating lever extension and the one-increment stop lever. If necessary, reposition the stop lever (See Adjustment No. 38e).

35. *Escapement Shaft Ratchet and Pin (DS) (Figure 38)*

The escapement shaft ratchet must be pinned firmly to the escapement wheel shaft. If the ratchet keyway does not fit the pin tightly, the resulting play will adversely affect character spacing. To correct the condition, remove the escapement wheel shaft (Removal Procedure No. 119a, b, d, e, f, h, i, j). Drive out the old pin. File a tapered flat on that portion of the head of the new pin which will face toward the mounting bracket and install the pin. Place the ratchet on the escapement wheel shaft so that the keyway lines up with the pin. Slide the escapement wheel sleeve on the shaft and tighten the escapement wheel shaft screw so that the ratchet is forced on the pin.

36. *Escapement Ratchet Pawl and Pin (DS) (Figure 38)*

The escapement ratchet pawl rotates on a shaft riveted to the side of the carriage escapement wheel. The pawl must rotate freely and the shaft must be firmly riveted. If the pawl sticks, or the pin is loose, the machine will space erratically or the carriage may skip. If the pawl sticks, lubricate it with a light bearing oil; if the pin is loose, remove the carriage escapement wheel (Removal Procedure No. 119b, d, e, f, h, i) and restake it. If there is not enough stock to allow restaking, replace the pin with a new one.

37. *Anti-backlash Spring (DS) (Figure 39)*

The anti-backlash spring should be positioned not more than .005" from the escapement wheel, and approximately ¼ of the way from the tip of the tooth. The anti-backlash spring cover must hold the spring firmly in place. To test, depress the back space key and look for a slight movement of the flying dog away from the flying dog stop roller. If the flying dog fails to move, the spring is too close to the wheel; if there is excessive movement, the spring is to far from the wheel. To adjust, loosen the anti-backlash spring mounting screw and move the spring to the desired position.

38. One-Increment Space Key (DS)

a. The one-increment space keylever, link, and shaft (Figure 39-10) must operate freely. If the lever binds and does not return to the unoperated position, remove it and check for burrs, bent shaft, twisted keylever, or weak return spring.

b. The one-increment space link tension spring insures positive return of the mechanism to rest position. If return is sluggish, check the one-increment space shaft at the rear of the machine for binds. Replace the return spring if damaged or weak.

c. The one-increment space keylever and the one-increment space link is equipped with a yielding spring to prevent forcing any of its parts in the event the keylever is depressed while the flying dog is over the one-increment stop. If this spring should yield during normal operation replace it.

d. The one-increment stop (Figure 39-6) on the end of the one-increment space shaft must be positioned on the shaft so that when the one-increment keylever is depressed, the stop is raised into position before the flying dog is released. In unoperated position, the one-increment stop must be resting low enough to allow the flying dog to clear it. Adjustment is made by loosening the one-increment stop set screw and rotating the stop to the desired position. Retighten the set screw securely to hold the adjustment.

e. The one-increment stop lever operates the flying dog actuating lever and the position of the one-increment stop lever determines the release time of the flying dog. The flying dog must release each time the one-increment space key is depressed, but not before the one-increment stop is raised into operated position. If the flying dog fails to release, loosen the set screw in the one-increment stop lever and raise the lever. If the flying dog is releasing to soon, move the stop lever down. Retighten the set screw to maintain the adjustment.

f. The keylever bottoms on the one-increment space stop. The stop must be positioned to allow sufficient rotation of the one-increment space shaft to perform all functions of the one-increment space mechanism without the flying dog actuating lever bottoming in the carriage escapement wheel. Adjust by loosening the stop mounting screw and move the stop up to decrease keylever stroke; down to increase it.

39. Tabulator (DS)

a. Basic Functions

(1) There must be a few thousandths of an inch clearance between the carriage release lever vertical arm and the carriage release rod. Adjustment is made with the tabulator adjusting screw in the bottom of the tabulator bracket. Loosen the adjusting screw lock nut and turn the screw in to increase clearance; out to decrease it. If sufficient adjustment cannot be obtained by means of the adjusting screw, form the carriage release lever vertical arm.

(2) The flying dog release lever must be positioned so that in its unoperated position it will not interfere with the operation of the flying dog when a four-increment character is printed. It must, however, have sufficient throw to release the dog from the escapement wheel when the tabulator keylever is depressed. To adjust, form that portion of the carriage release lever which is parallel to the lever shaft. Use a pair of pliers and form the lever toward the front of the machine to increase clearance between the flying dog and actuating lever; toward the rear of the machine to decrease clearance and increase throw.

(3) The flying dog should be released by the flying dog release lever as the tabulator keylever reaches 3/4 of it travel. There must be a slight amount of play between the release lever and the tabulator keylever and the tabulator bracket lever. To increase the amount of keylever travel before release, form the release lever to increase the amount of play between the parts; to decrease travel, form the lever to reduce the amount of play. *(Note:* Adjustment 39a (1), (2), and (3) are interrelated. If one is changed, the others must be checked.)

(4) In the unoperated position, there must be 1/32" clearance between the tabulator reed (Figure 5-1) and the tabulator stops along the entire length of the carriage. To adjust this clearance, form the right end of the rear actuating lever down to decrease clearance; up to increase it.

(5) The tabulator reed must be in position to engage the tabulator stop before the carriage releases. To adjust, reform the front actuating lever (See Adjustment 39a (3)).

b. DSJ Functions

In the process of tabulating from the rough to the justified typing position, the following requirements must be met in the order in which they are presented.

(1) In the unoperated position, the friction block must clear the justifier setting shaft arm. To adjust, loosen the friction block mounting screws and reposition the block.

(2) Operation of the lock rod lever by the tabulator reed causes the lock rod to rise, thereby releasing the friction arm. The friction arm, actuated by the friction arm spring, presses the friction block against the justifier setting shaft arm and locks the justifier setting shaft and proportional bar slide in operated position. The lock rod must be set so that it will hold the friction arm lip approximately 1/32" in unoperated position and should release the arm when the tabulator keylever is depressed approximately ¼ of its full travel. If the lock rod releases too slowly, loosen the lock rod adjusting nut lock nut and turn the adjusting nut down. Turn the adjusting nut up to slow down the release. Retighten the adjusting nut lock nut to hold the adjustment.

(3) After the lock rod lever raises the lock rod to disengage the friction arm, the lever continues to rotate and operates the latch operating rod. The cam reset lock adjusting collar which is mounted on the rod, contacts the reset lock and moves it, causing the lock to release the reset lever and the justifier operating shaft. The operating shaft then shifts its position from operating the feed ratchet to operating the justifier bell crank. This action must occur immediately after the friction arm is released. To time the action, loosen the adjusting collar set screw and move the collar closer to the cam reset lock to speed up the action; away from the cam reset lock to slow it down. Retighten the set screw securely. *(Note:* the position of the collar must not interfere with the reset operation which takes place when banking the carriage.)

(4) As the latch operating rod continues to move, and after the justifier operating shaft has shifted its position, the cradle latch adjusting collar contacts the latch and causes it to disengage the cradle. This action must occur immediately after the operating shaft shifts its position. To adjust the cradle latch timing, loosen the cradle latch adjusting collar set screw and move the collar to the left (viewed from the front) to speed the latch release action; to the right to slow it down. Retighten the set screw securely. The collar to the immediate left of the latch prevents the latch from vibrating from under the cradle stud during machine operation. The collar must be positioned so that it retains the latch, but still allows a slight amount of free motion for the latch. The collar must be checked anytime the cradle latch adjusting collar is moved. *(Note:* When the justifier cradle is released from the latch, the flat surface of the latch stud on the cradle arm must be below the contact surface of the latch, otherwise the latch will re-engage the stud when the tabulator key is released, thereby preventing justification. To obtain more cradle drop, peen the justifier cam follower tip up.)

(5) Next, the center slides must be drawn clear of the removable margin stop before the carriage begins to move. This function is controlled by the margin release rod, and should be adjusted when the rod is in the vertical position. To accelerate disengagement, loosen the release rod adjusting nut lock nut and turn the adjusting nut clockwise; counterclockwise to retard the action. Retighten the lock nut securely (See Adjustment No. 241).

In making the adjustment, there must be some play between the release rod adjusting nut and the release lever along the entire length of travel of the center slides.

(6) After all of the above functions have occured, the flying dog must release.

40. Repeat Key (DS) (Figure 39)

As the repeat key is depressed, the repeat shaft lever draws the repeat latch connecting link down and, by means of the repeat latch operating spring, pivots the latch against the flying dog actuating lever. The repeat shaft lever is pinned to the repeat shaft and the amount of

connecting link movement is controlled by the length of the repeat key stroke. The amount of movement must be sufficient to insure that the latch fully engages the flying dog actuating lever. The repeat key bottoms on an adjusting screw in the same manner that cap and fig shift levers do. To adjust the stroke of the repeat keylever, loosen the adjusting screw lock nut and back out the screw to increase the length of the stroke; turn the screw in to decrease it. Retighten the lock nut to hold the adjustment.

41. One and Three-Increment Back Space (DS)

(Note: The three-increment back space operation must be set correctly before the one-increment back space can be checked.)

a. Perform Adjustments No. 18a, b and No. 37.

b. When the three-increment back space keylever is depressed, the escapement shaft ratchet is rotated three teeth moving the carriage three increments to the right. The length of the keylever stroke determines the amount of back space movement. The stroke should be long enough to allow the escapement shaft ratchet to rotate the ratchet pawl three teeth on the escapement wheel. There must also be a slight amount of overthrow to insure that the pawl enters the third tooth. To adjust, loosen the back space adjusting screw lock nut and turn the screw (Figure 15-5) in to shorten the stroke; out to lengthen it. When making this adjustment, be sure the keylever is bottoming on the adjusting screw and not on the one-increment frame stop mounting screw. If the keylever does contact the frame stop mounting screw, remove some stock from the one-increment back space keylever.

c. The one-increment back space keylever pivots on the three-increment back space keylever, and when operated, the escapement shaft ratchet is rotated one tooth on the escapement wheel. A slight amount of overthrow is desirable as in the three-increment back space operation. To adjust, loosen the one-increment back space frame stop mounting screw and move the stop up to decrease the amount of ratchet rotation; move the stop down to increase rotation. Retighten the frame stop mounting screw securely.

42. Non-Print Mechanism (DS) (Figure 49)

a. The non-print shift lever must be positioned in the non-print shift lever housing so that it moves freely, but must be held firmly enough by the housing nub in the non-print position so that it will not slip during machine operation. To adjust, loosen the shift lever set screw and reposition the lever, or loosen the non-print shaft retaining collar and reposition the shaft and lever. Retighten the set screw securely.

b. In the non-print position, the non-print lever must be positioned so that it will engage the non-print stop washer and not the stop washer lock nut. To adjust, loosen the non-print bell crank set screw and rotate the bell crank until the lever is in the desired position. Retighten the set screw to hold the adjustment.

There should be a minimum amount of play between the non-print lever and the shoulder screw upon which it pivots. If necessary, shim the shoulder screw to eliminate excessive play.

c. The non-print stop washer, which is mounted on the hammer stop nut, must engage the non-print lever before the hammer strikes the type font. Before adjusting the non-print stop washer, make sure the hammer weight is set correctly and that the hammer release timing is correct (See Adjustment No. 34). Set the hammer impression lever at maximum setting and move the non-print shift lever to the non-print position. Loosen the stop washer lock nuts and back off the lower nut until the stop washer is low enough to allow the hammer to print. Raise the stop washer until the hammer no longer strikes the type. Lock the stop washer in this position by tightening the lock nuts securely. *(Note:* While making this adjustment, the lock nuts must be tightened after each adjustment and then the adjustment checked. Do not test an adjustment while the lock nuts are loose as this will not give a true result of the setting.)

After adjusting, recheck the hammer length setting (See Adjustment No. 13g).

d. In non-print position, the ribbon feed pawl cutout lever must disengage the pawl from the ribbon feed gear. In the print position, the cutout lever must permit complete pawl and gear engagement. To adjust the cutout lever's position, loosen the two cutout fulcrum mounting screws and move the fulcrum accordingly. Retighten the mounting screws securely to hold the adjustment.

43. Forms Attachment (Figure 18)

a. The right Forms Attachment bell crank stop

supports the Forms Attachment suppressor in the horizontal position. The suppressor must be perfectly parallel to the repeat key bracket and must be free between the bracket and bell crank stop. Form the suppressor to obtain parallelism; form the bell crank stop to increase or decrease suppressor clearance.

The right bell crank stop must be positioned as close to the hammer stop nut as possible without contacting it as the hammer moves forward. Loosen the bell crank stop mounting screw and move the stop to the proper position.

b. During normal machine operation, the lower step of the Forms Attachment suppressor is engaged by the hammer stop nut. The tips of the suppressor must remain engaged by the right bell crank and the Forms Attachment actuating lever must not contact the space bar holder link. The suppressor's position for normal operation is determined by the left bell crank stop. Loosen the bell crank stop mounting screw and reposition the bell crank stop.

The suppressor tension spring holds the suppressor against the left bell crank stop during normal machine operation, and return it after each hammer stroke during Forms Attachment operation. If there is insufficient spring tension, loosen the spring bracket mounting screw and move the bracket to the left. If this does not increase the spring tension sufficiently, the spring may be weak and should be replaced.

c. During Forms Attachment solenoid plunger travel, the upper step of the suppressor is positioned between the hammer stop nut and the repeat key bracket and the Forms Attachment actuating lever is rotated releasing the hammer. The release of the hammer must be timed so as to take place after the suppressor is positioned and just before the plunger bottoms in the solenoid. To test, operate the plunger manually and check for this requirement. If more travel is needed to properly position the suppressor, loosen the two bottom motor box and solenoid bracket mounting screws and move the bracket to the right (viewed from the underside).

If the hammer releases before the suppressor is in position, form the end of the Forms Attachment actuating lever up; if the hammer fails to release, form the lever down.

On DS machines, the Forms Attachment pivot bracket must be positioned so that it does not interfere with the increment stops during normal operation, but must move the two-increment stop clear of the flying dog before the hammer releases during Forms Attachment operation. Adjustment is made by loosening the pivot bracket mounting screws and repositioning the bracket. Retighten the mounting screws securely to hold the adjustment.

d. The hammer weight and hammer length settings for machines equipped with Forms Attachment are standard settings (See Adjustments No. 13c and 13g). To test the suppression of rule and leader line segment characters, set the machine impression setting at minimum impression setting and operate the attachment. At minimum setting, the hair line rule should print clearly without embossing the imaging material. If the impression is too light for this character, remove the suppressor and stone down the high step to reduce suppression. This adjustment should be made gradually; check the suppressor in the machine frequently to avoid removing too much material. *(Note:* Do not increase or decrease the hair line rule impression by adjusting the hammer length or hammer weight as this will affect the overall impression of the machine.)

If the impression of the hair line rule is heavy, it is an indication that the high step in the suppressor is too thin, either through wear or previous adjustments. When this condition exists, it is recommended that the suppressor be replaced with a new one.

An alternate method of correcting heavy hair line rule impression is to stone down the low step of the suppressor. While this adjustment is being made, *the hammer length must be adjusted each time the suppressor is replaced in the machine and tested.*

e. The toggle switch handle is returned to and held in the unoperated position by the toggle switch leaf springs. If the handle fails to return, check the springs for sufficient tension and reform or replace if necessary and check the handle ball and pin for freeness.

The toggle switch contacts must be positioned as shown in Figure 17 (Inset A).

f. Moving the toggle switch to the continuous operating position actuates both the solenoid and the Forms Attachment motor. The cam on the motor shaft opens and closes the leaf switch which is wired in series with the so-

lenoid thus opening and closing the solenoid circuit. The contacts of the leaf switch must be positioned so there is a positive make on the high part of the cam and a positive break when the leaf drops into the low part of the cam. Adjustment is made by forming the upper leaf of the switch.

g. As the carriage moves during continuous Forms Attachment operation, the lip of the Forms Attachment cutoff trip on the margin rack contacts the cutoff switch lever and rotates the lever so that it opens the normally closed Forms Attachment cutoff switch. The cutoff switch lever must be parallel to the margin rack and positioned so that it is rotated far enough by the cutoff trip to open the switch, and still has sufficient free movement to allow the trip to pass under it without binding. Parallelism is adjusted by loosening the cutoff switch bracket mounting screws and repositioning the bracket. The cutoff switch lever height is adjusted by forming the switch bracket up or down.

h. To test if the rule and leader line segment is properly centered in relation to the hammer face, insert the VariTyper test type in the anvil and remove the paper or other imaging material from the machine. Operate the single stroke Forms Attachment switch position and imprint the test symbol on the hammer face. The test may be made in either lower case or figure shift position. The two parallel vertical lines should be centered on the hammer face with approximately .010" clearance between the lines and the edges of the hammer face (Figure 74). To obtain this setting, first check the hammer centering (see Adjustment No. 13b) and then adjust the driver arms laterally by means of the driver arm brace adjusting nuts (see Adjustment No. 9d(1)). (*Note:* #1900 Vari-Clear ribbon will not print on the hammer face. To overcome this, place a piece of carbon paper between the hammer face and the type.)

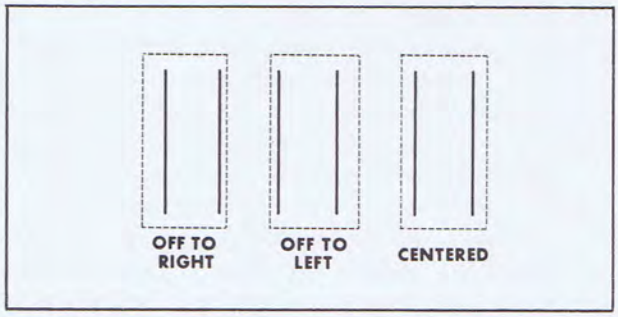


FIGURE 74 Rule and Leader Line Segment Adjustment

44. Center Slides (DS) (Figure 75)

a. The center slides must be free on the mounting screws. If either or both of the screws should loosen, the operation of the slides will be impaired.

b. The reset center slide must move to the left during the beginning of the rough copy operation. If the slide fails to move, check the center slide tension spring to make sure it is strong enough to move the slide. If the mounting screws are tight and the spring tension is sufficient but the slide still fails to operate properly, check the reset lever and shaft for binds and that the reset cam tip is not jammed under the reset cradle lever roller.

c. The justifier center slide must move freely when engaged by the removable margin stop. If the slide does not move freely, disconnect the proportional bar slide link and check the justifier setting shaft for binds. Also check the position of the friction block. If the block is set too close, it will impede the movement of the justifier setting shaft and, consequently, the free movement of the center slide. To correct this condition, loosen the friction block mounting screws and raise the block slightly.

d. The center slide tension spring must be strong enough to raise the center slide stops to their limit. If the stops are not raised high enough, first check the slide for binds, and then check the spring. If the spring is damaged or weak, either strengthen it by removing a few coils or replace it with a new one.

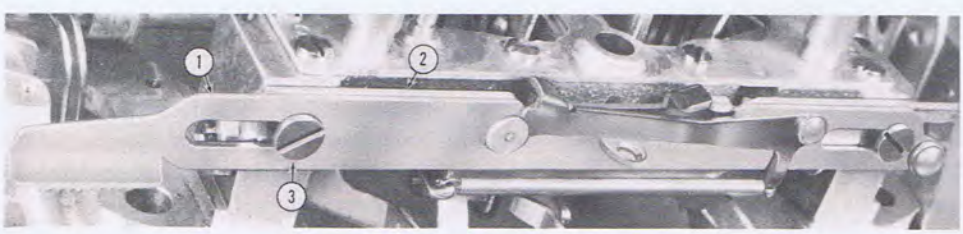


FIGURE 75

1—Justifier Center Slide
2—Reset Center Slide
3—Center Slide Mounting Screw

45. Margin Indicator Dial (DS)

a. The gear on the margin indicator dial shaft must engage the carriage spring barrel gear with a minimum of play. However, they must not mesh so tightly as to cause the spring barrel to bind. To check, move the carriage to the right (viewed from the front) for one full revolution of the spring barrel and visually check the mesh of the gears. If there is too much play, loosen the dial shaft rear bracket mounting screws and move the bracket to the right. After adjusting, move the carriage slowly to the left to check for binds. If the spring barrel does not turn freely or the carriage band lifts away from the barrel, the mesh of the gears is too tight and the rear dial shaft bracket must be moved to the left.

b. The dial pointer is keyed to the dial shaft by means of a spring friction washer so that as the shaft rotates, the pointer also rotates. The washer spring tension must be sufficient to prevent slippage of the pointer and still permit manual positioning of the pointer. To adjust, remove the hub, washer, pointer, and spring washer and increase the bend in the spring washer to increase tension; flatten it to decrease tension.

c. The dial assembly must be centered on the shaft and as close as possible to the pointer without interfering with its rotation. To adjust, loosen the set screw in the dial back plate hub and reposition the dial so that the set screw in the hub is in the 12 o'clock position. The imprinted line on the scale must also be in the 12 o'clock position. To adjust, remove the three scale mounting screws and rotate the scale to the proper position.

d. A friction washer between the dial bezel and the dial back plate holds the bezel in position without slippage and still allows it to be rotated manually. To adjust the tension of the friction washer, remove the three dial scale mounting screws, loosen the set screw in the dial back plate hub, and slide the back plate down the dial shaft exposing the friction washer. Increase the bend in the washer to increase tension; flatten it to decrease tension. When reassembling, make certain the dial is centered (See Adjustment No. 45c).

46. Justifier Indicator Dial (DS)

a. The justifier shaft gear should engage the center slide rack with a minimum amount of play. To adjust, form or shim the dial shaft rear bracket. *Do not form the center slide rack.*

b. There should be a minimum amount of end play in the dial shaft. To adjust, loosen the set screw in the dial pointer hub, loosen the dial pointer shaft knob, and reposition the pointer on the shaft. Retighten the set screw and the knob.

c. The justifier dial should be centered on the shaft and as close to the pointer as possible without interfering with its rotation. To adjust, loosen the set screw in the dial back plate hub and reposition the dial. Retighten the set screw.

d. When a maximum length line is typed, the dial pointer must be aligned with the zero line on the left side of the dial. To check, move the proportional bar slide so that its roller is in line with the justifier cam follower shaft and depress the tabulator key just enough to lock the proportional bar slide in position. Visually check the alignment of the pointer and the zero line. To adjust, loosen the set screw in the pointer hub and reposition the pointer so that it is aligned with the zero line. Retighten the set screw.

47. Justifier (DS) (Figures 43 and 44)

The space bar, besides actuating the escapement, also actuates the justifier mechanism. Before making any adjustments to the justifier mechanism, check all operational settings to insure that they are correct.

a. Space Bar (DS)

(1) The space bar must clear the front of the case and the space bar bracket must clear the keylevers. Adjustment is made by loosening the space bar bracket mounting screws and repositioning the bracket. In some cases, it may be necessary to form the bracket arms to get proper clearance.

(2) The depth of the space bar stroke is controlled by the space bar stops on the bottom front edge of the case. The stops must be positioned so that when the space bar is bottomed, the top of the space bar will be slightly above the level of the case. To adjust, remove the stops, remove the rubber covers from the stops, and form the stops. Be sure both stops are even so that when the space bar is bottomed, it will contact both stops at the same time.

In unoperated position, the space bar is held in contact, by spring tension, with the stop mounted on the left side of the

space bar bracket. The space bar should be positioned so that it has 7/16" throw. Usually, this will align the top of the space bar with the bottom of the lower row of key buttons. To adjust, loosen the space bar bracket and stop mounting screw and move the stop toward the front of the machine to raise the space bar higher; move the stop toward the rear of the machine to lower the bar. On some machines, the hole in the stop may not be elongated and all adjustments must be made by forming the stop.

(3) The lift lever on the justifier operating shaft must be positioned so that in the rough copy position it just clears the cam lever assembly actuating spring. Adjustment is made by moving the space bar holder link. Loosen the mounting screws in the front end of the link and move the link toward the front of the machine to move the lever closer to the spring; move the link toward the rear of the machine to move the lever away from the spring.

In the operated position, the left lever on the justifier operating shaft must clear the underside of the justifier bracket. If it does not, check the unoperated position to be sure the lever is as close as possible to the cam lever assembly actuating spring, and check the space bar travel.

(4) The space bar holder link, by means of the space bar bell crank, space bar bell crank connecting link, justifier operating shaft actuating lever, and the flying dog actuating lever bent link, operates the flying dog actuating lever to release the flying dog. The flying dog should release just before the space bar bottoms. Release action of the dog is adjustable by means of the actuating lever bent link. By increasing the bend in the link, the link is shortened, thereby accelerating the release action. Reducing the bend (partial straightening) in the link will lengthen it, thereby delaying release action. When properly adjusted, the link must have some free play in both the rough copy and justified positions. Also, the blade of the flying dog must not bottom in the carriage escapement wheel. *(Note:* Adjustments No. 47a (1-4) are interrelated. If one is changed, the others must be checked.)

b. Feed and Check Ratchets

(1) The feed and check ratchets are held in a housing mounted on the justifier cam bracket and must move against each other freely. If a bind exists, remove the ratchets (Removal Procedure No. 141) and clean and stone, if necessary, the contacting surfaces. *Do not lubricate the ratchets.*

(2) In unoperated position, the teeth of the feed ratchet should be slightly behind (toward the feed rolls) those of the check ratchet. Since the ends of both ratchets rest against the ratchet housing adjusting bracket, movement of the bracket will affect both ratchets and still maintain their relative positions. Therefore, the requirement is, in effect, controlled in manufacture. However, a slight amount of adjustment can be obtained by moving one side of the bracket forward or backward, being careful not to bind the ratchets.

(3) The check ratchet must be perfectly free in the ratchet housing with a minimum of end play. To adjust, form the fixed end of the ratchet housing bracket.

(4) The check ratchet springs fit into slots in the underside of the ratchet and must have only enough tension to hold the ratchet against the top of the ratchet housing. To test, depress the ratchet and then release it. Upon releasing, it should snap back into position. If the ratchet fails to do this, check the springs to make sure they are properly seated and that the ratchet is free in the housing. Then form or replace the springs.

The feed ratchet spring has a duel purpose – to hold the ratchet up and to return it to the unoperated position after feeding. Proper lifting tension is adjusted by forming the spring or if necessary installing a new one. Feed ratchet return is adjusted by loosening the spring mounting screw and repositioning the spring. Retighten the mounting screw to hold the adjustment. The adjustments are interrelated and if one is changed, the other must be checked.

(5) The feed and check ratchets should be positioned so that as the justifier cam follower is fed, it is aligned with the corresponding row of steps on the justifier cam. Adjustment is made by moving the ratchet housing adjusting bracket forward

or backward. If the adjusting bracket is to be moved toward the rear of the machine, it may be necessary to first form the fixed end of the ratchet housing to get enough room to move the ratchets. After adjusting, test the check ratchet; it must be free to move up and down in the housing with a minimum of end play (See Adjustment No. 47b (3)).

(6) During rough copy typing, the feed ratchet should carry the cam follower approximately ¼ of a tooth beyond the check ratchet when the space bar is bottomed. To adjust, loosen the set screws in the feed ratchet actuating lever on the justifier operating shaft and reposition the lever to obtain more or less throw. If the feed ratchet is stopped by the ratchet housing bracket before sufficient throw is achieved, form the bracket to allow more room for the ratchet. After adjusting, check the check ratchet end play (See Adjustment No. 47b (3)).

(7) The feed ratchet operating lever on the justifier operating shaft must be positioned laterally so that when the operating shaft is in the rough copy position the lever will engage the feed ratchet. When the operating shaft is in the justified position the lever must clear the feed ratchet. To adjust, loosen the set screws in the operating lever and reposition it on the shaft. *(Note:* Adjustments No. 47b (6) and (7) are interrelated. If one is changed, the other must be checked.)

c. Justifier Cam Follower

(1) In rough copy position, the tip of the justifier cam follower should be 1/64" to 1/32" above the justifier cam. To adjust, peen the neck of the cam follower or the frame latch.

(2) The cam follower must slide freely on the cam follower shaft. If the cam follower binds, or moves sluggishly, remove it (Removal Procedure No. 139) and the cam follower shaft and clean the shaft and the cam follower bushing. If necessary, use crocus cloth or fine steel wool to remove any burrs or stubborn dirt from the shaft. *Do not lubricate the shaft.*

The cam follower must also slide freely on the cradle brace. If it does not, clean the brace and the cam follower and lubricate the brace.

(3) As the cam follower moves down the cam, it must remain aligned with the row of steps corresponding to its position on the check ratchet. To test, move the cam follower out any number of teeth on the check ratchet, tabulate, and manually rotate the cam. Count the steps and visually check the alignment all the way down the cam. If the cam follower is aligned with the wrong row, reposition the ratchets (See Adjustment No. 47b (5)). If the cam follower does not stay on the same row all the way down, form the cam follower.

(4) The cam follower blade must be positioned so that when the cam follower drops down the last step on the cam, the blade releases from the check ratchet. If the blade remains in the ratchet, loosen the cam follower adjusting screw lock nut and turn the screw in (clockwise) to advance the release; turn the screw out (counterclockwise) to retard the action.

(5) As the cam follower drops off the last step on the cam it must be returned to the unoperated position by the cam follower return finger. If the cam follower fails to return, check the cam follower blade to be sure it is clear of the check ratchet (See Adjustment No. 47c (4)). Check the cam follower shaft and cradle brace for binds (See Adjustment No. 47c (2)). If the condition still exists, strengthen or replace the cam follower return finger tension spring.

d. Proportional Bar Slide

(1) The proportional bar slide must operate freely on the justifier cradle. The slide roller must not contact the actuating bar while typing rough copy. If the slide roller does contact the actuating bar, check the cradle roller to make sure it is firmly secured to the cradle and that the actuating bar is riding squarely on it. If necessary, form the frame latch up slightly to lift the cradle roller higher. If the slide binds, clean the slide and the cradle and stone any burrs, check the slide link at its pivot points, and check the center slide and justifier setting shaft for binds.

(2) In justified copy operation, when the proportional bar slide is at the cradle pivot point (center of proportional bar slide

roller aligned with center of cam follower shaft), the actuating bar should be resting on both the cradle roller and the proportional slide roller. To test, move the carriage away from the banked position and manually release the frame latch. (Do not use the tabulator key.) Move the slide roller toward the cradle pivot point. When the slide roller is approximately ¼" from the pivot point, it should begin to contact the actuating bar. If the slide roller contacts the bar too soon, loosen the justifier cam bracket and raise the left (viewed from the rear) end of the bracket. If more adjustment is needed, slot the bracket mounting holes, or peen the tip of the cam follower down. After this adjustment, check the clearance between the top of the justifier cam and the cam follower (See Adjustment No. 47c (1)). If the slide roller does not contact the actuating bar before reaching the pivot point, reverse the above procedure.

e. Actuating Bar

(1) The actuating bar must rise and fall freely without binding. To test, manually release the frame latch, rotate the cradle to its lowest position, then pull the carriage slowly toward the left (viewed from the rear). The actuating bar should rise to its highest position before the carriage escapement rack starts to move, and when the carriage is released, the bar should drop unhesitatingly.

The tension of the counter-balance spring connected between the carriage escapement rack and the carriage assembly should be only sufficient to assist in the raising of the bar when returning the carriage. Do not make any adjustments to the spring to overcome binds.

If a bind does exist, remove the actuating bar (Removal Procedure No. 132) and clean all pivot points, including the escapement rack guide rod, remove any burrs, and check for bent parts. Also check the carriage for freedom of movement (front guide, carriage steady brackets, etc.).

(2) There should be 3/64" clearance between the actuating bar stop roller and the actuating bar when the carriage is in banked position. This clearance can be reduced or increased by forming the frame latch up or down. After adjustment is completed, check the operation of the actuating bar lock (Adjustment No. 47e(3).

(3) In its operated (locked) position, the actuating bar lock (Figure 45-1) must hold the actuating bar in its raised position with a minimum of clearance between the actuating bar and the actuating bar stop roller. To reduce clearance, form the tip of the lock up; to increase clearance, form in the opposite direction or grind off the necessary amount of material from the lock. Do not adjust the position of the stop roller as this will alter the roller's adjustment as described in Adjustment No. 47e(2).

In its unoperated (unlocked) position, the tip of the actuating bar lock must clear the hub of the justifier bell crank in order to permit unrestricted movement of the actuating bar. To obtain needed clearance, form the actuating bar lock.

f. Justifier Cam

(1) The justifier cam must be free to rotate on its shaft with a minimum of end play. If it does not rotate freely, remove the cam (Removal Procedure No. 138) and clean it and the cam shaft. Remove any burrs from the shaft with crocus cloth or fine steel wool.

(2) The justifier cam stop must be positioned so that the cam follower tip will overlap the top edge of the cam by approximately 2/3 of the cam's width. To adjust, loosen the stop mounting screw and reposition the stop. Retighten the mounting screw to hold the adjustment.

(3) The justifier cam return spring must hold the cam against the stop securely so as to prevent the cam follower from slipping off the edge of the cam when tabulating. The return spring must have sufficient tension to return the cam to unoperated position when the cam follower drops off the last step on the cam. To increase the tension, loosen the return spring shoulder screw lock nut and pull the end of the spring farther through the hole in the screw; move the end of the spring closer to the hole in the screw to reduce tension. Retighten the lock nut to hold the adjustment.

g. Justifier Operating Shaft and Lift Lever

(1) Upon tabulating, the justifier operating

shaft must slide freely to the left (viewed from the rear) so as to position the lift lever under the justifier cam bell crank link. If the shaft sticks or is sluggish, check the shaft and bearings for dirt or burrs, and check the operating shaft compression spring for sufficient tension.

(2) The operating shaft lift lever must clear the bottom of the bell crank link. If it does not, check Adjustment No. 47a (2). If the lift lever is as low as possible and still does not clear the link, raise the link (See Adjustment No. 47h (1)) or remove some stock from the link. Be careful to remove only enough stock to allow the lift lever to fit under the link.

h. Justifier Cam Bell Crank Pawl

(1) The justifier cam bell crank pawl must engage each tooth on the justifier cam by a sufficient margin each time the space bar is actuated. To adjust, form the L-shaped portion of the pawl stop to the right (viewed from the rear) to increase the amount of engagement. However, the pawl must not interfere with the free rotation of cam. To check, manually rotate the cam and check for clearance between the tip of the pawl and the cam rack. Forming the L-shaped stop to the left will raise the link slightly. In making this adjustment be sure to maintain clearance between the stop and the cam rack.

(2) In unoperated position, the tail of the pawl must seat in the L-shaped portion of the pawl stop. If it does not, check the stop for burrs and clean and lubricate the pawl and the stop.

In operated position, there must be a slight amount of clearance between the tip of the pawl and the left (viewed from the rear) side of the pawl stop. To adjust, form the pawl stop. In forming any portion of the pawl stop, take care not to crack the metal.

(3) When the space bar is operated, the justifier cam must be rotated sufficiently so that the cam follower will move down one step. To test, move the cam follower out to the 15th (last) position on the check ratchet, tabulate, and slowly operate the space bar. Each time the space bar is bottomed, the cam follower must move down one step. If the cam follower fails to move down, install a longer bell crank link. To get room, it may be necessary to form the L-shaped portion of the pawl stop to the left being sure to maintain clearance between the pawl and the cam. If there is still insufficient cam rotation, change the starting position of the justifier operating shaft lift lever so that it is closer to the bottom of the bell crank link. Adjust with the space bar holder link. (See Adjustment No. 47a (2)). Be sure to cross check any changes with the space bar settings (See Adjustment No. 47a (1-4)).

i. Justifier Cradle

(1) The justifier cradle must rotate freely on the justifier cam follower shaft. During justified typing, as the cam follower drops off the last step on the cam, the cradle must rest on the cradle adjusting screw. If the cradle binds, remove the shaft (Removal Procedure No. 145 a, b, c, d, e) and check it and the cradle for burrs and clean and replace the shaft. *Do not lubricate the shaft.*

(2) A maximum and minimum length justified line must end with an even right hand margin. To test, justify a maximum and minimum length line making sure the last character in both lines is a lower case "l". If the minimum length line is short on the justified side, loosen the cradle adjusting screw lock nut and turn the adjusting screw in; if the line is long, back out on the screw. Tighten the lock nut to hold the adjustment and repeat the test.

j. Feed Ratchet Lock

The feed ratchet lock is part of the ratchet housing and is located directly below the feed ratchet. Its function is to prevent overthrow of the cam follower during rough copy typing. It must be high enough to prevent overthrow, but low enough to permit normal feed ratchet operation. To test, hold the space bar fully depressed and manually try to slide the justifier cam follower along its shaft. If the cam follower does slide along the shaft, the lock is to low. Adjustment is made by forming the lock up. If the lock interferes with normal feed ratchet operation, form it down.

48 Carriage Banking Operation (DS)

a. When the carriage is banked, the left margin stop must engage the reset center slide and move it to the right to rotate the reset lever

and shaft. The center slide must stop the carriage movement. If the margin stop bypasses the slide, the stop or the lip of the slide or both may be worn. Replace either or both parts with new ones.

If the center slide tension spring is weak, it may not hold the slide up in the proper position, allowing the stop to bypass it. If the spring is weak or damaged, replace it with a new one. Also, if the margin release rod does not have sufficient play (See Adjustment No. 39b (5)) it will hold the reset slide lip down causing the margin stop to bypass it.

b. The friction arm reset cam is mounted on the cradle reset cam and both cams are, in turn, mounted on the reset lever. As the reset center slide is moved to the right by the left margin stop, the friction arm reset cam moves the friction arm to its unoperated position, allowing the friction arm lock rod to drop and lock the lever in unoperated position. The friction arm reset cam must move the arm a sufficient distance to release the friction block and to clear the lock rod. About 1/32" overthrow should be allowed. Adjustment is made by loosening the friction arm reset cam mounting screws and moving the cam to the desired position.

The friction arm lock rod must operate freely in the lock rod lever and the lock rod bracket. If the lock rod fails to drop or hesitates before dropping, the lock rod may be bent or dirty, or the lock rod operating spring may be weak. Remove the rod (Removal Procedure No. 151) and clean and check for burrs. If it is bent, straighten it or replace it with a new one. If the spring is weak or damaged, replace it with a new one.

c. When the friction block is disengaged, the center slide tension spring pulls the justifier setting slide to the right and returns the proportional bar slide to the starting position. If the assembly fails to return freely, check: the center slide spring to make sure it is properly connected and has sufficient tension; the center slide mounting screws to make sure they are securely tightened; the justifier setting shaft and center slide for binds; the portion of the cradle on which the proportional bar slide rides and the inside of the slide for dirt or burrs; the pivot points of the proportional bar slide link for binds; the friction block to be sure it completely disengages the justifier setting shaft arm. Clean all parts and check for burrs, replace any weak or damaged spring and if the friction block release is not complete, loosen the block mounting screws and move the block away from the shaft arm.

d. The cradle reset cam pushes a roller on the cradle lever raising the cradle above the frame latch allowing the latch to be pulled under the stud on the side of the cradle arm. After the cradle movement ceases, the cradle lever continues to move and the cam follower rack release link which is connected between the cradle reset arm and the cam follower rack release rotates the rack release to the vertical position and depresses the feed and check ratchets. The purpose of the cam follower rack release is to make certain that the cam follower is returned to its starting position whenever the carriage is banked. When typing is resumed, the rack release disengages the ratchets permitting normal operation. To adjust the amount of cradle reset lever rotation, loosen the cradle reset cam mounting screws and move the cam closer to the lever to increase rotation; away from the lever to decrease it. However, with the center slide bottomed, there must be a slight amount of play between the cam tip and the cradle lever roller. After adjusting, re-check the friction arm reset cam (See Adjustment No. 48b).

If sufficient rotation of the cam follower rack release cannot be obtained by adjusting the cradle reset cam, form the rack release link to increase rotation.

In its unoperated position, the rack release must completely disengage the ratchets for proper ratchet operation. Therefore, check one adjustment against the other whenever either requirement is adjusted.

If the cradle slips off the frame latch when the carriage is banked, or during rough copy operation, check the cradle stud and the frame latch for wear. Replace worn parts with new ones to correct the condition.

e. The justifier reset lever engages the collar on the cam reset rod and moves the rod to the left (viewed from the rear). Through the cam reset lever collar, the movement of the rod returns the cam reset lever to its latched position and this action returns the justifier operating shaft to the feed ratchet operating position. Just before the cam reset lever

reaches fully operated position, the cam reset lock tension spring pulls the lock into position to hold the reset lever. If the operating shaft fails to reset, check the reset lock tension spring to make sure it has sufficient tension to operate the lock; check the reset lever to make sure it reaches its fully operated position to clear the lip of the reset lock; check the position of the cam reset lock adjusting collar to be sure that it does not prevent full travel of the reset lock (See Adjustment No. 39b (2)). To adjust, loosen the set screws in the cam reset lever collar and move the collar toward the justifier reset lever to increase the lever's travel. Be sure to allow a slight amount of overthrow.

49. Machine Spacing (Figure 76)

The VariTyper test type is used as a guide in checking machine spacing. Machine spacing tests are made with the test type used in the widest horizontal spacing available on the machine. Before using the test type, make sure it is properly fitted (See Adjustment No. 50b (1), (2), (3)) and all excess motion is removed from the carriage. Differential spacing models must be tested in standard spacing setting (standard shift arm pulled out). To make the test:

a. Strike the "p" (No. 28) key in lower case position thirty times.
b. Return the carriage to the starting point being careful not to go beyond it. Do not lift the escapement rack or use the one-increment space or space bar.
c. Feed the paper up 2 clicks (54-tooth ratchet), 4 clicks (108-tooth ratchet), or 8 points (Linomatic).
d. Strike the "a" (No. 2) key in the lower case position thirty times, printing the cross symbols directly below the first row of crosses so that the vertical stems overlap.

If the "p-a" spacing is good, the vertical stems of the crosses will join and form one continuous straight line. If the "a" crosses print to the right of the "p" crosses, the machine is spacing "a-p". If the "a" crosses print to the left of the "p" crosses, the condition is "p-a". The acceptable tolerance for misalignment of the vertical stems is approximately ½ of the stem's width. Usually when the "p-a" spacing is correct, the machine will give good all-around spacing.

To check the "y-b" spacing, use the same procedure used to check the "p-a" spacing except that the "y" (No. 16 key) cross is printed over the "b" (No. 15 key) cross. If the "y-b" spacing is good, the vertical stems of the crosses will join and form one continuous line. If the "b" crosses print to the right of the "y" crosses, the condition is "b-y"; if the "b" crosses print to the left of the "y" crosses, the condition is "y-b". The allowable tolerance is ½ the stem width. If bad "b-y" or "y-b" conditions exist, it can sometimes be improved by replacing the shuttle arm. It may be necessary to try several shuttle arms in order to find one that will improve the condition. Changing the shuttle arm will necessitate retesting the "p-a" spacing and refitting all the type.

If bad "p-a" or "a-p" spacing conditions exist, they can be improved by shifting the position of the index head top plate. During manufacture, this adjustment is one of the most important and most critical basic settings. After having been properly set, the top plate is pinned to the index head casting to prevent movement. This position should not be changed unless the Service Representative is absolutely certain, after having checked all other possible causes of bad spacing, that shifting the top plate is the only means of correction.

To shift the index head top plate:

a. Remove the two front index head top plate mounting screws. Remove the line guide brackets and shield frame stop as they are released. Replace the two mounting screws and tighten them lightly.
b. Drive the two locating pins into the index head casting until they free the top plate.
c. Loosen (do not remove) the center top plate mounting screw.
d. Move the top plate to the desired position; back (away from hammer) to correct "a-p" condition, forward (toward hammer) to correct "p-a" condition. Retighten top plate mounting screws and check the adjustment with the test type. *(Note:* Movement of the index head top plate should be a parallel movement – that is, one end of the plate should be moved the same amount as the opposite end. Although a non-parallel movement will correct the "a-p" or "p-a" condition, it may adversely affect the relation of the "a" or "p" to the "b" or "y". It is, therefore, necessary to check the squareness of the top plate after the "a-p" cross test is made. To check the top plate squareness: proceed in the same manner as in the "a-p" cross test substituting "b" crosses over "a" crosses; then print "y" crosses over "p" crosses.

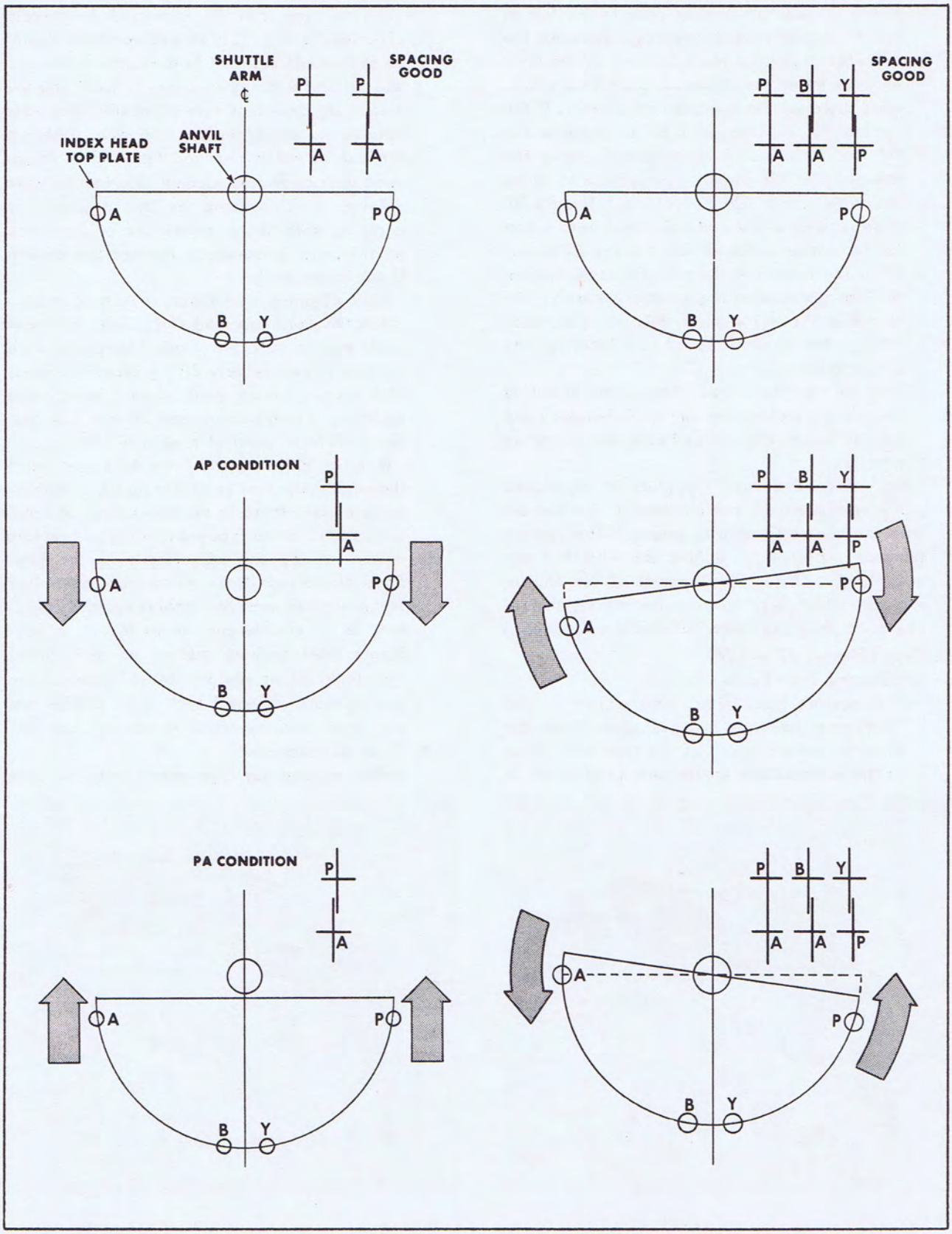


FIGURE 76 INDEX HEAD SPACING ADJUSTMENTS

If the "a" and "p" crosses print to the left of the "b" and "y" crosses respectively, move the left side of the top plate forward, or the right side backward, or the entire plate in a clockwise direction for maximum adjustment. If the "a" and "p" crosses print to the right of the "b" and "y" crosses respectively, move the top plate in the directions opposite to those described above. The acceptable tolerance for misalignment of the vertical stems in this test is the entire width of the vertical stem.)

e. After the correct setting is obtained, tighten the top plate mounting screws securely. Relocate the two top plate locating pin holes using a No. 41 drill. Insert new locating pins (29-0396-0).

f. Remove the two front top plate mounting screws and replace the line guide brackets and shield frame stop. Replace the mounting screws.

After the index head top plate is positioned and pinned, recheck the position of the hammer with the hammer centering gauge. If the hammer requires recentering, adjust the shield frame accordingly. *(Note:* Replacement of the shuttle arm may affect "a-p" spacing, but moving the index head top plate rarely affects "b-y" spacing.)

50. *Type (Figures 77 and 78)*

a. Cleaning Type Fonts

The smooth mechanical operation of the VariTyper machine depends greatly on the unrestricted movement of the type font. Many of the malfunctions attributable to sluggish or sticking type can be corrected by merely cleaning the font. This is a chore which should be performed frequently by the machine operator and is best done by rubbing the back and the web of the type font with a lint-free cloth. Be careful to avoid bending the web. Stubborn dirt can be easily removed with a cloth dampened with denatured alcohol or other suitable solvent. Avoid soaking the font in solvent or scraping with sharp implements or abrasives as this will permanently damage the smooth finish of the back.

When cleaning type fonts, it is well to also clean the anvil face and slot. Clean the anvil face with a lint-free cloth (dampened with solvent if excessively dirty); clean the anvil slot with a library card or hard bond paper folded to a card's thickness. *Do not lubricate the anvil face, anvil slot, or type font.*

If after cleaning the type font and anvil thoroughly, the font is still sluggish or sticks, make certain there is no mechanical obstruction or bind in the type positioning assemblies before making any adjustments to the font. Some of the conditions which may impair free font movement are: type rubbing against shield; bind in the shuttle arm, driver levers, or keylevers; font bushing rubbing on anvil yoke; type face rubbing against shield frame; chrome plating worn off anvil face; bent shuttle arm pin; type bushing tight on shuttle arm pin.

b. Type Adjustments

Before making any type adjustments, be sure

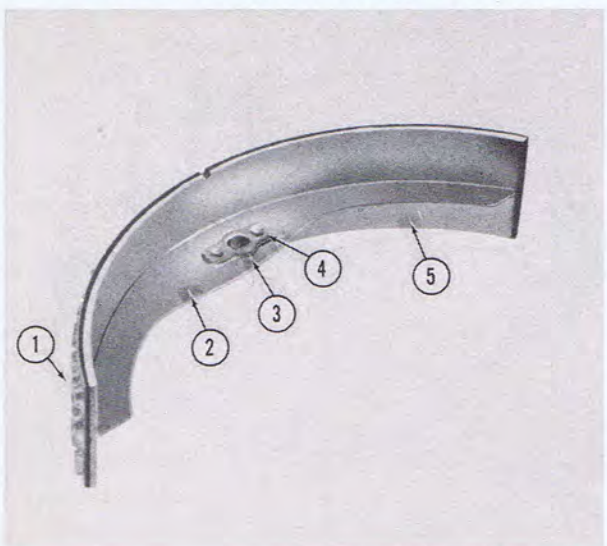


FIGURE 77 TYPE FONT (Top View)
1—Shell 2—Web 3—Bushing 4—Bushing Rivets 5—Back

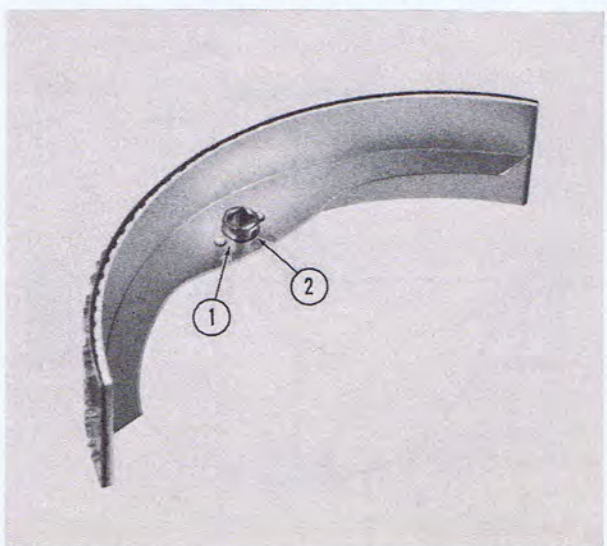


FIGURE 78 TYPE FONT (Bottom View)
1—Bushing 2—Bushing Opening

the hammer and shield frame assembly are properly adjusted and all excess motion has been removed from the carriage. Type adjustments should be carefully made since the font can be irrepairably damaged through careless handling.

(1) Anvil Fit

The type font must be fitted to the anvil. To check the fit, raise the anvil to the type change position, insert the type font, and press it lightly against the anvil. There should be equal contact between all points of the type back and the anvil. If the ends of the font contact the anvil but the center is held away, the type font is bellied; if the center of the font is in contact with the anvil but the ends are held away, the type font is winged. A bellied font must be corrected. To adjust, place the font on the type block, place a web punch near the outer edge of the web and tap gently to stretch the web. Care must be exercised to avoid over-stretching.

A winged type must be corrected only if it is causing bad spacing. Small amounts of wing can be corrected by forming the ends of the font inward. Care must be exercised to avoid crimping or creasing the web. If the amount of wing is so great that crimping cannot be avoided, the condition cannot be corrected.

(2) Shuttle Arm Fit

The type font bushing must fit the shuttle arm pin with barely perceptible clearance on all four sides. Too little clearance will result in the font sticking or being sluggish; too much clearance may result in a bad spacing condition ("a-p"), or cutting off the sides of some characters on large size types.

Proper front to back clearance is obtained by adjusting the type bushing tongue. To increase clearance, place the font on the cutout of the type block with the bottom of the bushing facing up and insert the end of the type broach marked with a "T" into the bushing. Tap the broach gently, forcing the bushing tongue out of the opening slightly. To decrease clearance, place the font on the type block and insert the tip of a fine punch into the open side of the bushing. Tap the punch gently to force the tongue in slightly. Make only slight adjustments and test frequently as excessive adjustment will cause the tongue to break necessitating replacement of the bushing.

Proper side clearance is obtained by forming the sides of the bushing. To obtain more clearance, place the font on the type block and insert the end of the type broach opposite the end marked with the "T" and tap it gently to force out the sides of the bushing. If sufficient clearance cannot be obtained using the broach, use a fine jeweler's file to remove some stock from the sides of the bushing. Remove stock equally from both sides of the bushing. After adjusting, check the front to back clearance. To decrease clearance, place the font in the type block with the bushing facing up. Place a blunt punch against the side of the bushing as far from the web as possible and tap gently to force the side in slightly. Adjust both sides of the bushing equally. If sufficient adjustment cannot be achieved, the bushing must be replaced.

To replace the type bushing, place the font on the type block with the bottom of the bushing facing down, and file the excess stock from the rivets; drive out the rivets. Insert the new bushing in the web making sure it is properly positioned and insert new pins in the bushing. Rivet both ends of the pins carefully to avoid damaging the web. If nails are used in place of pins, they must be cut to the proper length. After a new bushing is installed, check the anvil and shuttle arm fit and adjust if necessary.

The fit of the type font to the shuttle arm pin should be the same in lower case, cap and fig shift position (Figure 79). Front to back and side clearance in all three positions can be checked visually. Slight differences may exist, provided that the spacing on all three levels is not affected.

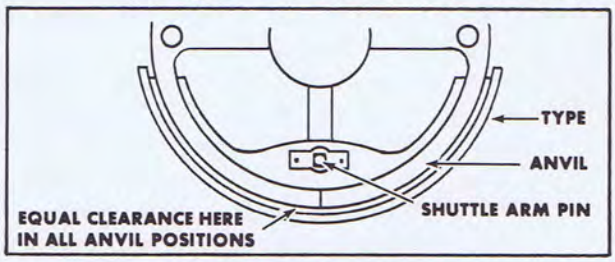


FIGURE 79 TYPE TO SHUTTLE ARM FIT

Shuttle arm squareness is tested using the VariTyper test type. Hold the back space key in its operated position and strike the "h" (No. 17) keylever. Feed the paper up 2 clicks (54-tooth ratchet), 4 clicks (108-tooth ratchet), or 8 points (Linomatic). Strike the same character in figure position, then repeat the operation in lower case. If the shuttle arm is true, the box symbols printed will be aligned – portions of the symbols being perfectly super imposed over each other (Figure 80). A shuttle arm which does not meet the standards as outlined above should be replaced.

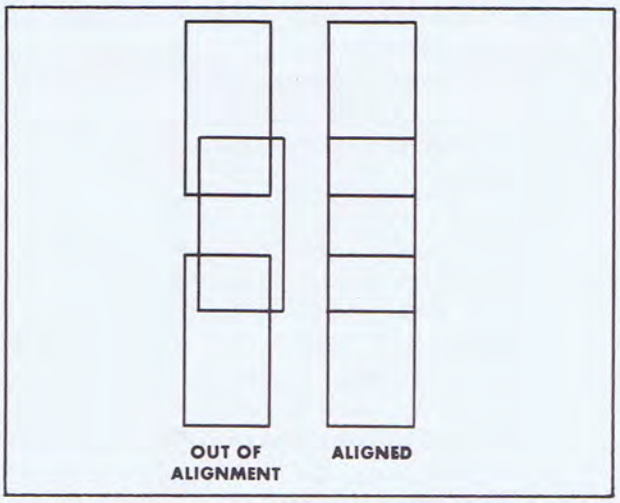


FIGURE 80 SHUTTLE ARM SQUARENESS TEST

(3) Web

The web must be perpendicular to the back of the type font as this determines the base line of the characters. If the web is bent, it may cause the type to stick or cause misalignment of characters. To test for sticking, first make sure the type font, anvil face, and anvil slot are clean and the font properly fitted to the shuttle arm pin. Raise the anvil to the type change position, insert the type font, and manually slide it back and forth. It must move freely. If it sticks or drags, remove it and check for burrs or dirt. Remove any burrs with fine crocus cloth. If it is clean and there are no burrs, place the font on the type block and visually inspect the web for any high or low spots. Form the web to correct any misalignment. Forming must be done with the fingers and should be made carefully and in slight graduations to avoid overadjustment. Never hammer the web as this will, in effect, peen the web causing the type font to wing. If the type still sticks, place the anvil in printing position and alternately depress extreme left and right keylevers without tripping the hammer. If the type sticks when the right keylever is depressed, the bind is behind the letters "b" to "q"; if it sticks when the left keylever is depressed, the bind is behind letters "y" to "p". To determine the exact point, start with the keylever nearest the center and work toward the end depressing the keylever without tripping the hammer until the type sticks. Observe the portion of the web that is just entering the solid portion of the anvil and form the web at that point.

A loose web, or one which has broken away from the type back cannot be repaired, necessitating replacement of the type font.

After freedom has been achieved, the alignment must be checked. Reduce the horizontal spacing and type each lower case character between the letter "n" (nqnanznwn etc.). All characters should be aligned with the "n" baseline. If they are not, place the type font on the type block and visually check to be sure the center portion of the web is perpendicular to the type back. Adjustment is made by forming the web. If a character or group of characters print below the baseline, the web behind them is high; if the characters are high, the web is low. Adjustment is made by forming the web.

(4) Type Needling (Figure 81)

Under normal use, type fonts will last several years before any signs of wear become apparent. Signs of wear will appear sooner on fonts which receive heavy usage or fonts used on applications where frequent repeat key operation is necessary. This type of wear becomes evident when portions of characters print light or do not print at all. This condition can be corrected by needling the light portion of the character and raising it to the height of the rest of the character. This is done by placing the font in a type vise and using a needle punch and jeweler's hammer to peen the character. Hold the punch loosely at the

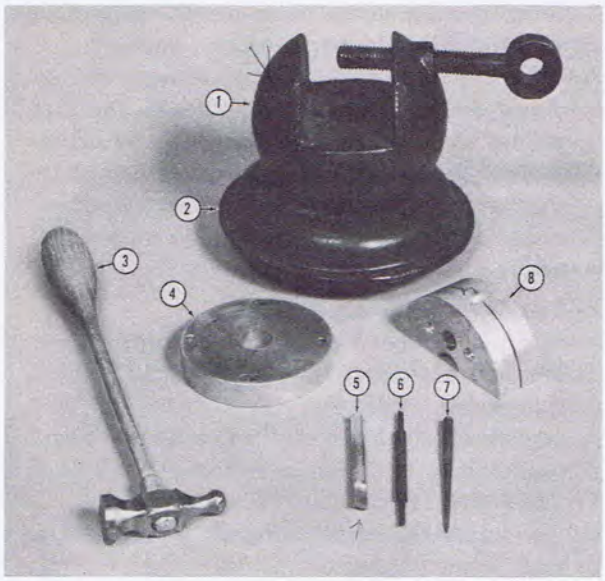


FIGURE 81

1—Type Ball 2—Type Ball Support 3—Jeweler's Hammer 4—Type Block 5—Web Punch 6—Type Broach 7—Type Needle 8—Type Clamp

base of the character where it is light and strike the punch lightly with the jeweler's hammer. Move the punch along the entire light area striking the punch as it is moved. *The type material must be peened, not pierced.* Piercing will weaken the character and cause it to collapse after a very short period of use. When using 1810 or 1225 ribbon, needling should be done at two steps below the impression setting at which the type is normally used. When using 1900 ribbon, needling must be done at the impression setting at which the type is used. Test the type frequently while needling to avoid overadjustment.

Overneedling can be corrected if the degree of correction required is slight. To do this, remove the ribbon and ribbon shield from the machine. Place the type in the machine and insert a piece of extremely fine sand paper or emery cloth between the hammer face and the font with the abrasive facing the font. Press the hammer against the font lightly and draw out the sand paper or emery cloth. Repeat this procedure a few times until the high spot is brought down.

If overneedling is excessive, correction is not recommended because the amount of material which will have to be removed will make the character obviously thicker on one side. It will be necessary to replace the font.

Punctuation marks such as the period and comma cannot be successfully needled because these characters are small and will not maintain correction.

51. *One and Two-Increment Suppressor Bracket (519 and 565) (Figure 50)*

To adjust the amount of suppression, loosen the suppressor bracket mounting screw and the nut on the suppressor spring bracket return spring mounting post (screw) and move the assembly up (machine resting on its back) to increase suppression or down to decrease it. *(Note:* When moving the suppressor bracket up, make certain there is sufficient clearance between the actuator bracket and suppressor spring bracket to permit unrestricted movement of the three-increment stop shaft latch.)

When repositioning the suppressor bracket, the assembly should be kept parallel to the horizontal plane of the machine. A good reference point is the horizontal ribbon shaft which is located directly below the suppressor bracket (See note at end of Adjustment No. 52).

52. *One and Two-Increment Suppressor Link (519 and 565) (Figure 50)*

To increase or decrease the amount of suppression, loosen the suppressor link mounting screw lock nut and move the link to the left to increase suppression and to the right to decrease it. When adjusting the link, make certain that in extreme impression settings the suppressor shift bracket does not bottom on the support bracket stud, thereby preventing the hammer spring adjuster extension from being placed in these settings. *(Note:* The advantage of having two adjustments (Adjustments Nos. 51 and 52) which perform the same function is that neither should ever have to be set at its limits. When approaching the limit of one adjustment, the other can be used as a supplementary adjustment.)

53. *Heating Assembly (330) (Figure 82)*

a. Thermostat

The thermostat controls and maintains the heating unit at a constant temperature to assure optimum branding results. It should be adjusted so that heating unit will operate at all settings of the thermostat knob.

To adjust, remove the thermostat knob and cover and loosen the set screw in the collar

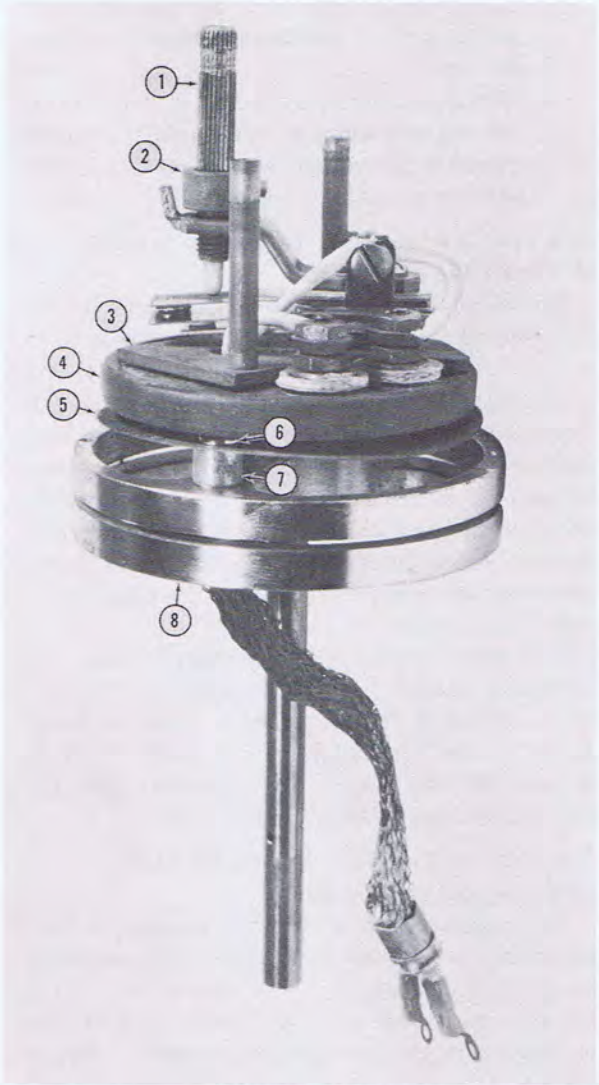


FIGURE 82 330 Heating and Thermostat Assembly
1—Thermostat 2—Thermostat Adjusting Collar 3—Heating Element Base Plate 4—Ring Heater 5—Shielding Plate 6—Screw 7—Spacer 8—Anvil and Shaft

on the thermostat shaft. Rotate the shaft so that the contact on the upper leaf just bearly touches the contact on the lower leaf. Position the shaft collar so that the set screw contacts the upper left portion of the stop. This is the minimum heat position. The collar must be high enough to allow the shaft to rotate so that the set screw contacts the opposite side of the stop. If necessary, reset the minimum position and raise the collar higher.

b. Thermostat Knob Detent Spring

The thermostat knob detent spring must press tightly against the thermostat cover to maintain the desired temperature setting. The detent spring scribe mark should be lined up with the arrow on the thermostat knob.

To adjust the knob, first loosen the set screw and remove the knob. Rotate the thermostat shaft to the maximum heat position and replace the knob lining up the pointer with the highest graduation mark on the thermostat cover. Press the knob down as far as possible and tighten the set screw.

c. Temperature Setting

The correct operating temperature of the heating assembly is approximately 220 degrees Fahrenheit. The thermostat indicator knob setting at which the desired temperature will be obtained is determined through the use of Thermomelt Heat indicator sticks.

To adjust the temperature, set the thermostat knob at the number two position. Mark the idle type side of the anvil between the thermostat cover and the anvil slot with Thermomelt Stik 09-0281-0 (orange, 213 degrees F) and Thermomelt Stik 09-0282-0 (yellow, 225 degrees F). Sufficient pressure must be applied to obtain a build up of Thermomelt material on the anvil. Move the machine switch to "On" and allow about one hour for the anvil to heat up. After the heat up time has expired, observe the two Thermomelt marks for heat reaction. If neither mark melts, the anvil temperature is to low. Increase the control knob setting to between 2 and 3 position. Allow ten minutes for the anvil temperature to adjust to the new setting. The thermostat knob is at the proper setting when Thermomelt Stik 09-0281-0 (orange) melts instantly and Thermomelt Stik 09-0282-0 (yellow) melts slowly. Increase the thermostat knob setting gradually until the proper setting is reached. If both Thermomelt marks melt at the number 2 position, the temperature is to high. Decrease the thermostat knob setting to between 1 and 2 position. Allow ten minutes for the anvil temperature to adjust to the new setting. Re-mark the anvil with both Thermomelt Stiks. Adjust the thermostat knob setting gradually until the proper setting is reached.

For the machine operator's convenience, the control knob may be repositioned on the setting position mark closest to the correct setting, as indicated by the Thermomelt Stiks, to simplify returning the knob to the correct setting, or to relay the setting to another operator.

54. Parallel Shield (330)

The parallel shield is positioned so that when the hammer is in the printing position the hammer face is centered in the shield opening. The shield should be parallel to the carriage and held just far enough from the anvil to allow unrestricted movement of the type font.

To position the shield vertically, loosen the two mounting screws in the left shield bracket and raise or lower the shield to the desired position.

To position the shield horizontally, loosen both the left and right shield bracket mounting screws. Adjust the shield by repositioning the left bracket. Position the right bracket so that the end of the bracket is approximately centered between the side of the shield frame arm and the head of the clearance adjusting screw.

55. Tubing Guides (330) (Figure 52)

The point of the "V" cut-out in the tubing guides should be aligned with the center of the shield opening. To adjust, form the guides up or down.

The guides should be positioned horizontally so that the tubing will be held in light contact with the ribbon shield. To adjust, loosen the tubing guide mounting screws and reposition the guides.

56. Tubing Clamp Springs (330) (Figure 51)

The tubing clamp leaf spring is positioned so that the lower end bottoms in the cut-out in the carriage end and the upper end presses against the tubing clamp. The amount of spring pressure can be adjusted by tightening or loosening the nut on the spring mounting screw to increase or decrease pressure respectively. However, care must be taken not to tighten the nut too much as this may distort the spring. On some machines, a tension spring between the tubing clamp and a post mounted in a collar which in turn is mounted on the hanger shaft holds the tubing clamp closed. The amount of spring tension is adjusted by loosening the set screws in the collar and rotating it on the hanger shaft.

57. Touch (330)

The touch timing should be set so that the escapement wheel pawl is disengaged from the escapement wheel just as the shuttle arm tail comes in contact with the index pin. Adjustment is made with the overall adjusting screw in the rear arm of the trip frame. Loosen the adjusting screw lock nut and turn the screw in to speed up the release; back out the screw to slow down the release. Retighten the lock nut to hold the adjustment.

The solenoid actuator switch should close just before the shuttle arm camming action is completed. Adjustment is made with the screw in the outer end of the switch actuating bracket. Loosen the adjusting screw lock nut and turn the screw clockwise to actuate the switch sooner; turn the screw counterclockwise to slow down the switch actuation.

58. Space Bar Cutoff Switch (330) (Figure 55)

During space bar operation, the space bar cutoff switch must be actuated before the solenoid actuator switch in order to prevent the solenoid from being energized. Adjustment is made by forming the space bar cutoff switch link.

59. Hammer (330)

a. Escapement Wheel Drop

The escapement wheel drop is adjusted in the same manner as other VariTyper machines (See Adjustment No. 13 d). However, the wheel should rotate approximately half a tooth before engaging the actuating lever blade.

b. Escapement Actuating Lever (Pin Drop)

The escapement actuating lever is adjusted in the same manner as other VariTyper machines (See Adjustment No. 13 e). Set the pin drop for 7 to 8 pins.

c. Hammer Stroke

With the solenoid plunger in its unoperated position, turn the hammer actuating spring screw until there is 19/32" clearance between the anvil and the hammer face. Lock the screw in this position with the adjusting screw lock nut.

d. Hammer Length

The function of this adjustment is mainly of a precautionary nature to prevent damage to the anvil and hammer face when the machine is operated without a type font in the anvil. Set the hammer length to the same setting used on other VariTyper machines (See Adjustment No. 13 g). This adjustment may be varied, if needed, to get proper impression.

e. Hammer Tension

With the hammer in its operated position, the hammer actuating spring should be compressed approximately 1/8". The amount of spring compression is adjusted with the hammer ten-

sion adjusting nut (Figure 54-2). Loosen the adjusting nut lock nut and turn the adjusting nut clockwise (viewed from the rear) to decrease the amount of compression; turn the nut counterclockwise to increase it. Tighten the lock nut to maintain the adjustment.

f. Anti-Backlash Spring

The anti-backlash spring prevents the escapement wheel from rotating when the back space key is operated. The spring should be positioned so that it is in the vertical position and engages the escapement wheel. To adjust the vertical position, loosen the anti-backlash spring mounting stud lock nut and rotate the stud to the desired position. Retighten the lock nut to hold the adjustment. To adjust the escapement wheel engagement, loosen the anti-backlash spring mounting screw and position the spring so that it just contacts the underside of the tooth directly above it. Tighten the mounting screw.

60. *Pawl Trip Lever (330) (Figure 54)*

The pawl trip lever is held in contact with the bottom of the escapement lever by spring tension. As a key is depressed, the trip lever must rotate sufficiently so that the pawl will be in position to engage the solenoid plunger lever before the solenoid is energized, and as the key is released, the trip lever must not allow the pawl to disengage the plunger lever before the solenoid actuating switch is opened. Adjustment is made by forming the tail of the trip lever. However, before adjusting make sure the trip lever rotates freely and the spring has sufficient tension to rotate it.

61. *Pawl (330) (Figure 53)*

The pawl is held in contact with the lever stop mounted on the pawl trip lever by means of a tension spring. The pawl must follow the movement of the stop. If it does not, remove the pawl and clean it and check for burrs or rust. Check the spring to make sure it has sufficient tension to rotate the pawl. If necessary, replace the spring.

When the solenoid plunger lever is in the operated position, it should engage the top of the pawl by approximately 1/16". To adjust, loosen the lever stop mounting screw and move the stop toward the front of the machine to decrease the amount of engagement; toward the rear to increase it. Retighten the mounting screw securely.

62. *Solenoid Plunger Lever (330) (Figure 53)*

The unoperated position of the solenoid plunger lever is determined by the recoil bracket bumper. The vertical arm of the lever should be in a vertical position. To position the plunger lever, loosen the lock nut holding the adjusting screw in the center of the recoil bracket bumper and turn the screw clockwise to increase the circumference of the rubber disc, thereby raising the horizontal arm of the lever which, in turn, moves the vertical arm forward. Turn the adjusting screw counterclockwise to achieve the opposite affect. Retighten the lock nut to hold the adjustment.

63. *Solenoid Cutoff Switch (330) (Figure 55)*

The solenoid cutoff switch should be operated by the plunger lever when the lever tip is 1/32" away from the top of the pawl. To test the sequence of this operation, disconnect the power cord from the electrical outlet and operate any keylever and hold it in its operated position. Push the solenoid plunger into the solenoid slowly. When the plunger lever is 1/32" from the top of the pawl, the cutoff switch contacts should open. Opening of the switch contacts is indicated by an audible click. Adjustment is made by forming the switch actuating leaf spring down to advance the switch contact opening; form the leaf spring up to retard the opening. When fully operated, the leaf spring should not contact the bottom of the switch.

64. *Space Bar (270 and 660) (Figure 56)*

In the unoperated position, the space bar should be slightly above the bottom of the lower row of keys. It should have 7/16" throw and in its depressed position it should not be below the keyboard cover. The unoperated position is adjusted by forming the space bar stops. To adjust the bottoming position, first remove the keyboard cover. Loosen the space bar stop screws lock nuts and raise or lower the screws to the desired position. Adjust both screws an equal amount so that the space bar contacts both screws when it is bottomed. Retighten the lock nuts to hold the adjustment.

65. *Fig Shift Keylever Left and Right (270 and 660) (Figure 57)*

a. As the fig shift keylever is actuated, there must be a slight amount of lost motion before it starts to rotate the anvil lift lever shaft. The amount of lost motion is controlled by the shift lever eccentric screw which con-

nects the shift lever and the fig shift lever link. To adjust, loosen the eccentric screw lock nut and reposition the eccentric screw to obtain the desired lost motion. Retighten the lock nut to hold the adjustment.

b. The fig row alignment is adjusted using the adjusting screws on the underside of the machine (See Adjustment No. 3).

66. Cap and Fig Shift Lock Brackets (270 and 660) (Figure 57)

The cap and fig shift lock brackets should be checked and adjusted every time the cap and fig shift keylevers are adjusted. The lock brackets should be positioned so that when the lock lever is depressed, it slips easily under the bracket and holds the anvil in its proper position. At the same time, only a slight amount of pressure on the shift key should be required to release the lock lever. To adjust, loosen the two lock bracket mounting screws and raise or lower the bracket as required.

67. Type Change (270 and 660) (Figure 57)

Raising the type change actuating lever must raise the anvil high enough above the front cover to allow easy installation and removal of type fonts. However, the anvil must not be raised above the anvil locating pin. In the bottomed position, the type change lever must completely release the anvil lift lever shaft dog so that the anvil rests on the anvil height adjusting screw. Adjustment is made by loosening the set screw in the hub of the type change inter lever and repositioning it on the type change shaft. The inter lever should be positioned so that when the anvil is bottomed on the height adjusting screw, the type change lever rests on or is slightly above the lift lever shaft dog.

68. Spacing Shift Assembly (270 and 660) (Figure 59)

a. The spacing shift lever must be positioned on the spacing shift shaft so that the gear on the gear sleeve corresponding to the selected spacing engages the escapement rack. To adjust, loosen the set screws in the hub of the spacing shift lever and reposition it on the shift shaft.

b. When the spacing shift lever is actuated, the rack lifting lever must raise the escapement rack above the largest gear on the gear sleeve. To adjust, loosen the set screws in the hub of the spacing shift lever and reposition it so that it will rotate the spacing shift shaft a greater amount. If sufficient adjustment cannot be obtained in this manner, the starting position of the rack lift actuating lever must be adjusted. Loosen the set screws in the hub of the rack lift actuating lever and reposition it so that in the unoperated position the rack lifting lever is closer to the escapement rack. Make sure, however, that the lifting lever does not contact the rack in the unoperated position.

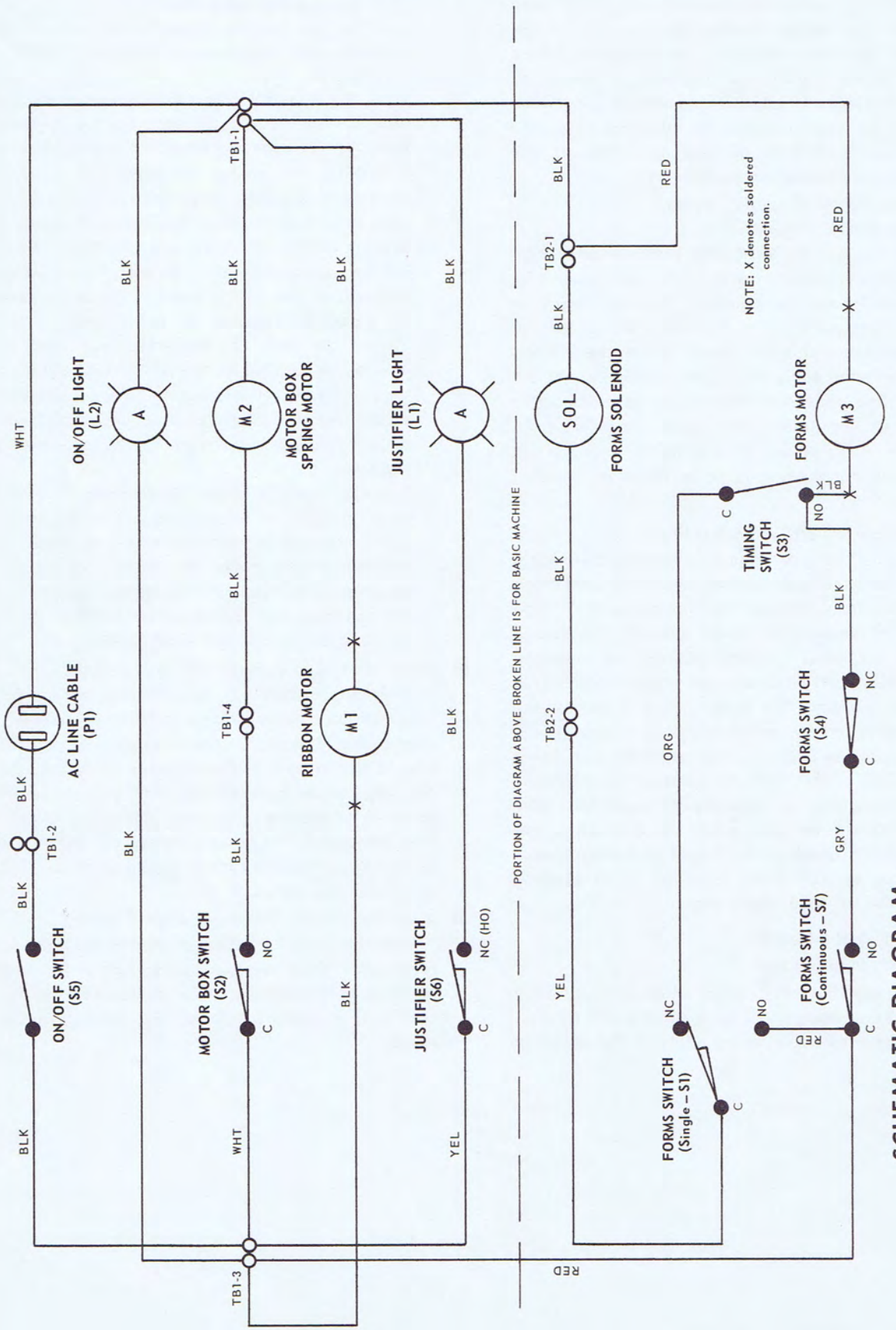
c. The spacing shift index dial should be positioned so that the letter or number in the index dial window corresponds with the gear engaging the escapement rack. To adjust, loosen the spacing shift index dial link adjusting nut lock nut and reposition the adjusting nut. Retighten the lock nut to hold the adjustment.

69. Margin Dial Cup Compression Spring (660)

The margin dial cup compression spring determines the amount of force required to manually rotate the dial cup. The compression spring should be set so that the operator can rotate the dial cup without difficulty and still supply enough pressure to the cup to prevent machine vibration from rotating it. To adjust, loosen the set screw in the compression spring retaining collar and reposition the collar.

70. Auto-Wind Roller Release Lever (Figure 27)

With the Auto-Wind Roller closed, the release lever must clear the rear cover. Adjust the rest position of the release lever by forming the detent spring coils to obtain the correct spring length.



SCHEMATIC DIAGRAM
Varityper Composing Machines
115V & 230V 50/60 CYCLE

FIGURE 83

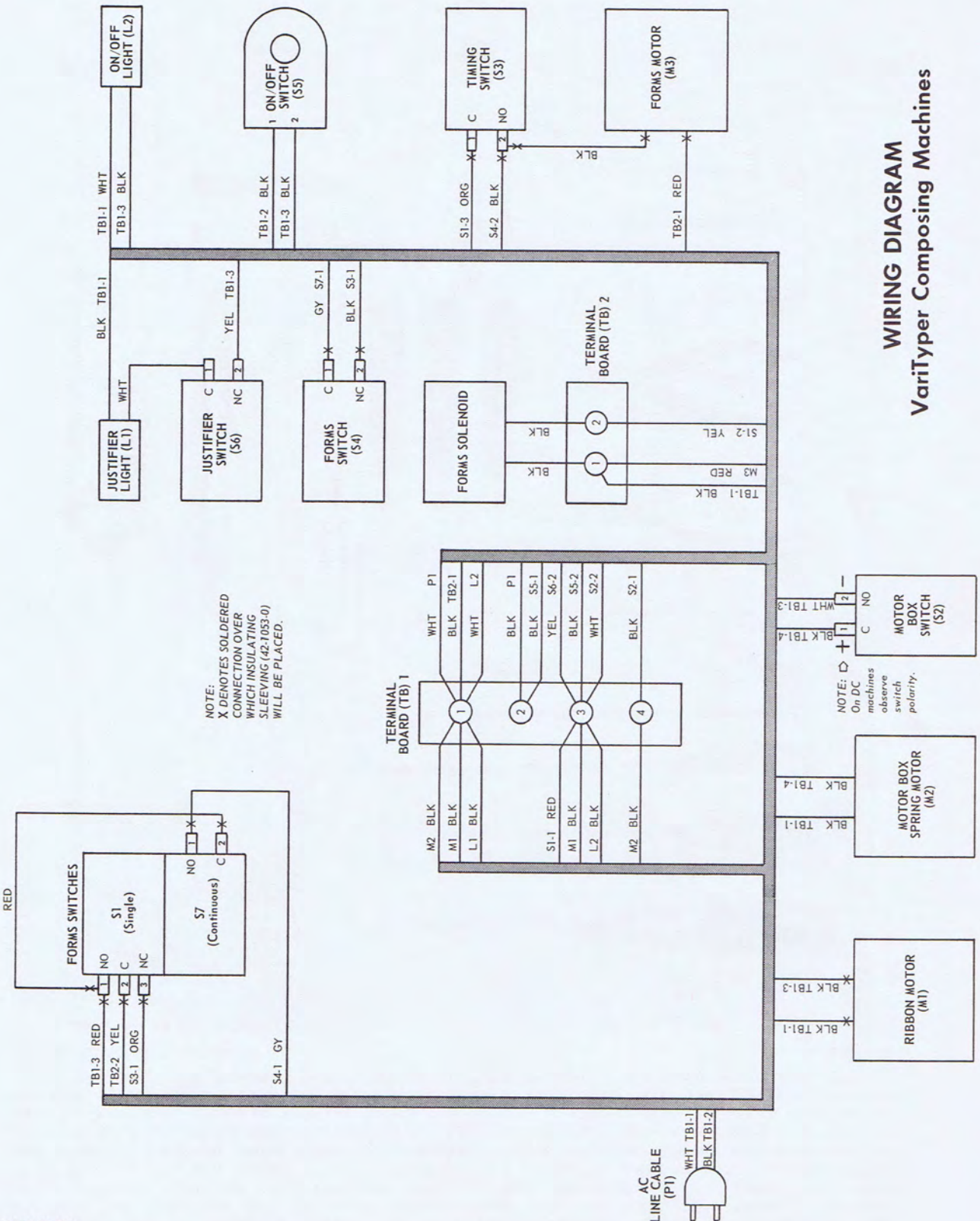

WIRING DIAGRAM
VariTyper Composing Machines
ON/OFF LIGHT (L2)
ON/OFF SWITCH (S5)
TIMING SWITCH (S3)
FORMS MOTOR (M3)
JUSTIFIER LIGHT (L1)
JUSTIFIER SWITCH (S6)
FORMS SWITCH (S4)
FORMS SOLENOID
TERMINAL BOARD (TB) 2
TERMINAL BOARD (TB) 1
FORMS SWITCHES
S1 (Single)
S7 (Continuous)
MOTOR BOX SWITCH (S2)
MOTOR BOX SPRING MOTOR (M2)
RIBBON MOTOR (M1)
AC LINE CABLE (P1)
NOTE: X DENOTES SOLDERED CONNECTION OVER WHICH INSULATING SLEEVING (42-1053-0) WILL BE PLACED.
NOTE: On DC machines observe switch polarity.

FIGURE 84

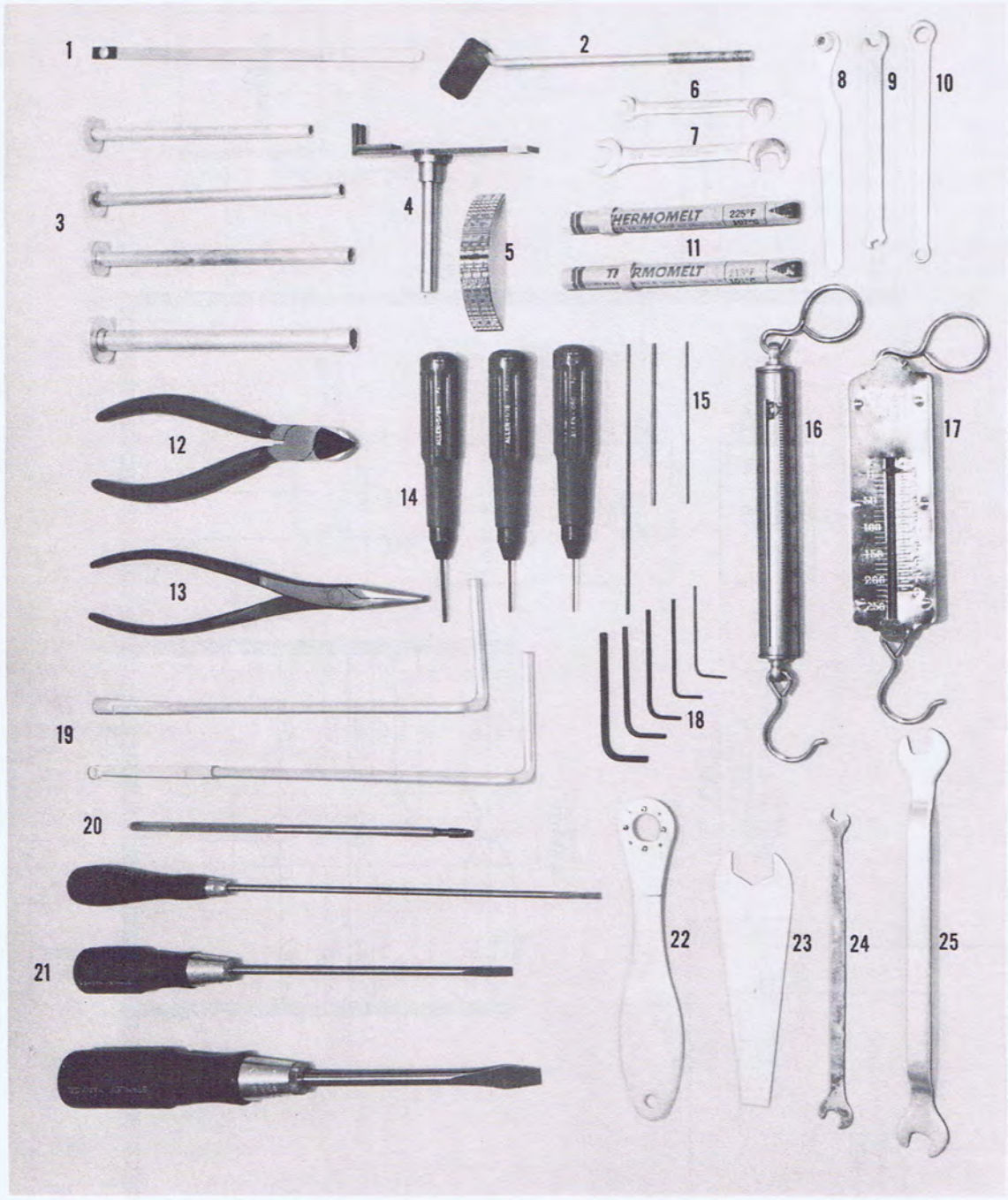


FIGURE 85 VARITYPER REPAIR TOOLS

1—Spring Clip Holder 09-0265-0 2—Hammer Gauge 09-0139-0 3—Socket Wrench 5/32, 09-0122-0; 3/16, 09-0125-0; 1/4, 09-0126-0; 3/8, 09-0127-0 4—Hammer Centering Gauge 09-0152-0 5—Test Type 09-0292-0 6—Open End Wrench 1/4 x 1/4 09-0227-0 7—Open End Wrench 3/8 x 3/8 09-0315-0 8—Hammer Tension Adjusting Wrench 09-0232-0 9—Open End Wrench 5/32 x 3/16 09-0223-0 10—Box Wrench 3/16 x 1/4 09-0123-0 11—Thermomelt Stik, Orange, 09-0281-0; Yellow, 09-0282-0 12—Cutting Pliers 09-0226-0 13—Duck Bill Pliers 09-0225-0 14—Allen Blade and Handle 5/64, 09-0339-0; 1/16, 09-0163-0; .050, 09-0175-0 15—Allen Blade 1/16, 09-0180-0; 5/64, 09-0340-0; .050, 09-0179-0 16—Pound Scale 09-0131-0 17—Ounce Scale 09-0132-0 18—Allen Key 1/8, 09-0222-0; 3/32, 09-0188-0; 5/64, 09-0178-0; 1/16, 09-0177-0; .050, 09-0176-0 19—Hammer Pivot Wrench (330) 09-0170-0; 09-0147-0 20—Screw Holder 09-0334-0 21—Screw Driver 1/8 Blade, 09-0134-0; 1/4 Blade, 09-0133-0; 5/16 Blade, 09-0041-0 22—Feed Roll Ratchet Wrench 09-0136-0 23—Variable Spacer Nut Wrench 09-0130-0 24—Open End Wrench 3/16 x 1/4 09-0224-0 25—Hammer Eccentric Nut Wrench 3/8 x 3/8 09-0155-0

Index

MECHANICAL AND ELECTRICAL PRINCIPLES

REMOVAL AND REASSEMBLY PROCEDURES

Removal and Reassembly Procedures (Cont'd)

ADJUSTMENTS

Form 1883

Composed on VariTyper Equipment, Produced in U.S.A. by MultiLith Offset